VOL. XX, NO. 4 MAY, 1948

THE TOOL ENGINEER

REG. U.S. TRADE MARK

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

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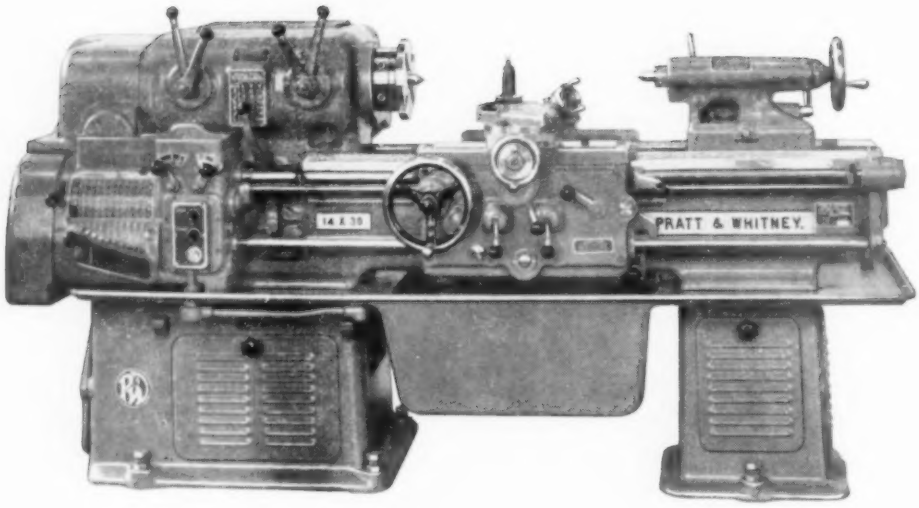
Behind every manufactured product is the tool engineer



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Coming right at you . . . . . . the trip of your dreams

Here is an opportunity of a lifetime to combine business with pleasure! You and your family can enjoy that "once-in-a-blue-moon" vacation . . . if you plan now to CATCH THE ASTE SPECIAL TRAIN, and attend the ASTE Semi-Annual Convention in Los Angeles. Make a fun and business date for October '48. Details on this page and the next. Read carefully and act at once. Yes, *do it now* if you want to be a part of the biggest ASTE fun fest ever planned!

The Trip

Board the ASTE SPECIAL TRAIN in Chicago, 12:01 P.M., October 7th . . . Arrive Los Angeles 11:30 A.M., October 10th. You may board the train at any stop enroute.

While traveling, and enjoying good fellowship, feast your eyes on . . . the great plains of the Middlewest . . . the colorful New Mexico Rockies . . . historical western Indian country . . . God's glorious handiwork of gorges and canyons . . . and finally, glamorous Los Angeles and Hollywood. Use postal card for full details.

Yes

I am interested in going to the Los Angeles Convention on the ASTE SPECIAL TRAIN.

Send me complete details.

Name _____

Street Address _____

City _____ Zone _____ State _____

There will be _____ in my party. ASTE Chapter No. _____

I understand that this card entails no obligation on my part and is not a firm reservation. I merely want full details of the trip, after which I will decide whether or not I can make it.

Here's the Itinerary . . . and the Cost

The route of the ASTE SPECIAL TRAIN traverses the heart of romantic America . . . the land of the pathfinders, traders and pioneers. Much of the way parallels the historic Old Santa Fe Trail, now the course of one of the finest railroads in the world.

THIS IS THE TIMETABLE

You may board the ASTE SPECIAL TRAIN at any regularly scheduled stop.

Oct. 7	Lv. Chicago . . . Dearborn Station (Noon) **(Shortly after leaving Chicago the ASTE SPECIAL TRAIN crosses the mighty Mississippi River at Ft. Madison)**	12:01 PM
7	Ar. Kansas City, Missouri	9:15 PM
7	Lv. Kansas City, Missouri	9:45 PM
8	Ar. Newton, Kansas	12:55 AM
8	Lv. Newton, Kansas	1:10 AM
8	Ar. La Junta, Colorado	8:10 AM
8	Lv. La Junta, Colorado **(Throughout the day the ASTE SPECIAL TRAIN will travel in the colorful valleys among the New Mexico Rockies, crossing the highest point on the route, 7,622 feet, at Raton Pass.)**	8:30 AM
8	Ar. Albuquerque, New Mexico **(Ample time allowed to stretch and browse around the adjacent Indian Museum. There you will see one of the finest exhibits of native Indian arts and crafts.**	7:00 PM
8	Lv. Albuquerque, New Mexico **(ASTE TRAIN continues westward through Indian country.)**	7:45 PM
9	Ar. Grand Canyon, Arizona **(A day you will never forget . . . scenic beauty at its best, crowned with Nature's ageless works of art. Fare includes motor trips along the rim of Grand Canyon, with a stop at the Government Observatory and the Watch Tower, overlooking the matchless, painted desert. Headquarters for the day will be El Tovar Hotel. All expense tour at Grand Canyon includes three meals at the Hotel. See for yourself "Sunset at Grand Canyon.")**	8:00 AM
9	Lv. Grand Canyon, Arizona **(THE ASTE SPECIAL TRAIN will cross the desert during the cool of the night.)**	8:00 PM
10	Ar. Los Angeles, California **(For three days, October 11-12-13, ASTE has planned one of the best and most complete conventions ever held. Watch for the program and further details.)**	11:30 AM

THE RETURN TRIP

You may return by any direct route:

(1) Via New Orleans.
(2) Via San Francisco, Salt Lake City and Denver.
(3) Via San Francisco, Portland and Seattle.

(Side trip, Los Angeles to San Diego, may be included in through ticket at no additional charge.)

THE COST

Round trip rail fare from Chicago to Los Angeles, $152.68 (Included: Tax, and all-expense Grand Canyon side trip with three meals at Hotel El Tovar. Meals on train extra.)

Add to above, cost of Pullman accommodations selected:

(1) Lower berth	**$24.04**
(2) Upper berth	**18.29**
(3) Compartment for two	**67.85**
(4) Drawing room for party	**85.04**

(Tax included)

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The Tool Engineer

Official Publication: American Society of Tool Engineers

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May, 1948

Vol. XX, No. 4

Prelude to Preparedness

THE COLD WAR seems to be growing warmer day by day. Situations, any one of which could give rise to the "stupid incident" that General Eisenhower warned would be most likely to cause another war, are cropping up with alarming frequency.

The halls of Congress resound with debates on the draft and Universal Military Training. Representatives of all branches of the armed forces are painting frightening pictures of lack of strength both in personnel and equipment.

With less fanfare and fewer headlines, industrialists and engineers are taking stock of their facilities, capacities and abilities with an eye to the role they must play in making the nation strong enough to enforce peace, or equipping it to fight again, whichever the case may be.

Tool engineers are key figures in preparedness planning—just as they were in the World War II production battle.

Their job may be somewhat less out of the ordinary than it was in 1941-42. The experiences of the recent war are still fresh enough in the memories of all who had a part in it for them to allow things to revert to the status they were in at the beginning of the last war. To do so would be signing a national death warrant. In event of another war, there can be no delaying actions. Now that the world has built an age of atomic warfare, with proximity fuses and supersonic guided missiles, there can be no time for starting at the beginning in production. We must be prepared—with carefully worked out plans for mass production of standard items of equipment.

It is largely true that in the early stages of war, the peace-minded country has to dust off its weapons from the last conflict. However, in these two and a half years since the end of World War II research has continued on a limited scale and has produced improvements in the innovations made during the war, as well as completely new developments.

With the aid of far-sighted industrial leaders, there has been a healthy tendency to work these new developments through to a stage in which they can be readily adapted for manufacture by mass production methods. That, of course, is one of the vital spots into which the tool engineer enters. In pre-World War II days if a new gun was developed, a new type vehicle designed, a few models were literally custom built for testing and experimentation. The men working on them sought to achieve the mechanism which would function most perfectly. When the war came they rolled up the blueprints and sent them to industry for immediate production. The story of what happened then is well-known. Adaptability to methods of mass production was the one factor which had been largely overlooked.

Under the guidance of the Munitions Board, industry and the various branches of the armed forces have been working together to standardize component parts of widely used items. During World War II there were such wastes as the setting up of separate production lines to make identical gun parts for the Army and Navy, just because each service had its own serial number for the part. That is one of the things that the Munitions Board is striving to eliminate.

Tool engineers can and are making great contributions to national strength. Their skill and experience provide the answer to the problems of planning for preparedness production. It is not a question of producing for war—yet. But the increasing threat of war makes necessary precision planning for such production.

Let's perfect the prelude before we're made to play the overture!

I. F. Holland

President 1948-49

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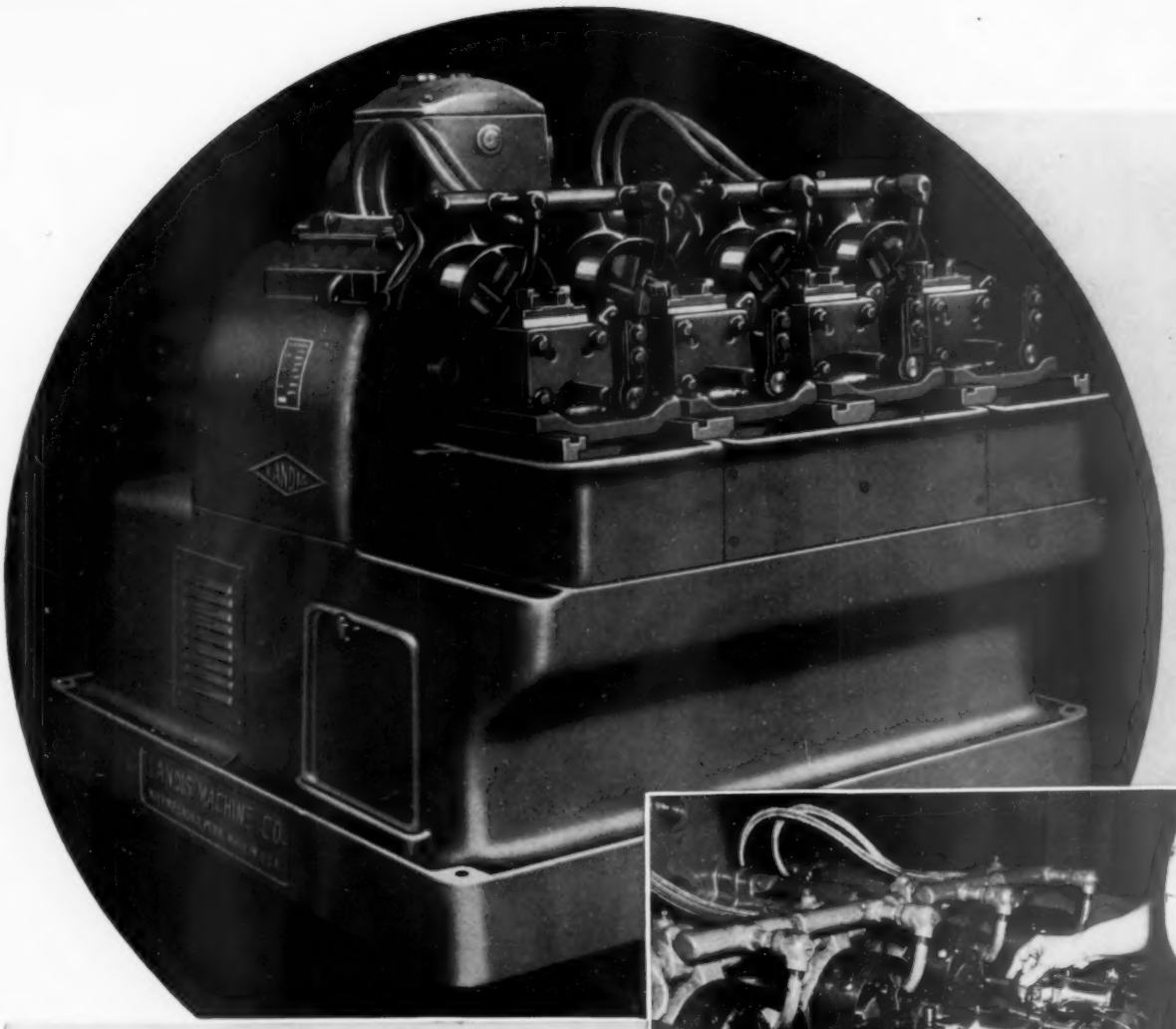

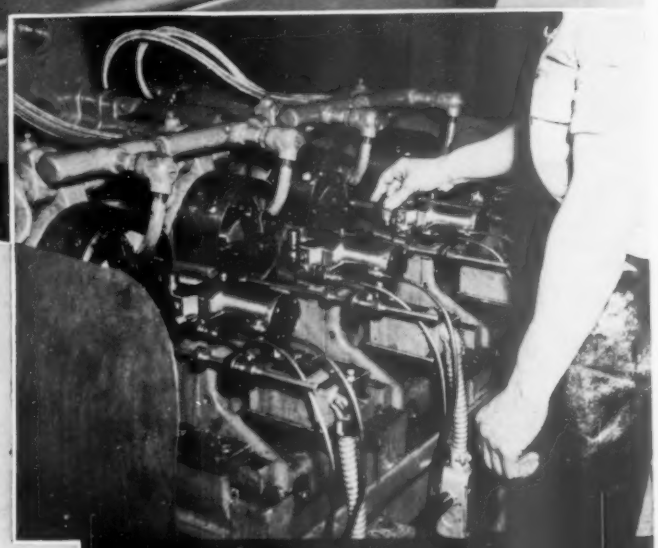

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SEMI-AUTOMATIC THREADING MACHINE

The Landis 4 Spindle Semi-Automatic Threading Machine is a precision machine designed for threading automotive parts, bolts, studs, rods, etc., on a high production basis.

Due to exclusive features in design it offers an unusually high percentage of efficiency.

Outstanding advantages are: High Production with Low Threading Speeds, Quick Set-Ups, Flexibility for all Diameters and for Special, Threading Operations, Elimination of Side Shave at Start of Thread, and Thread Concentricity.

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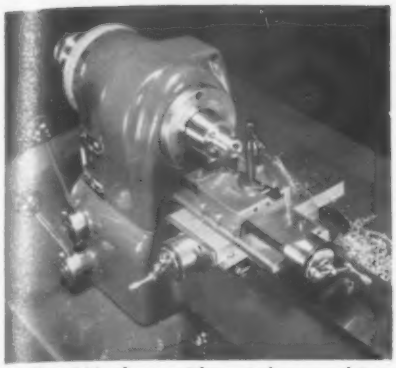

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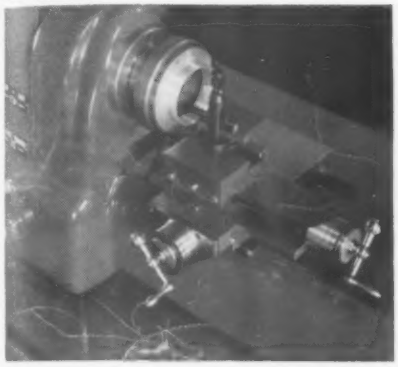
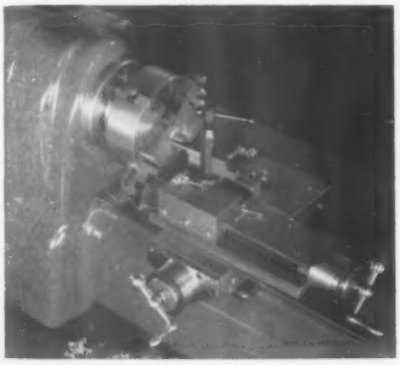


Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



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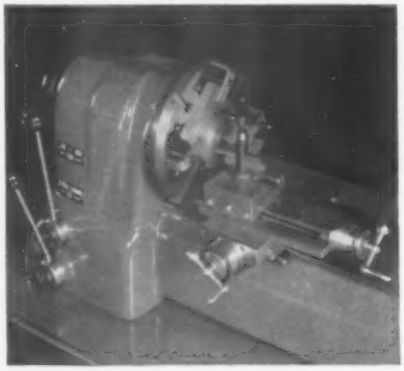

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HIGH SPEED PRECISION LATHE

Correct Size - High Speed - Precision Results

SPECIFICATIONS:
1" Collet Capacity
9" Swing
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8 Speeds to 4000 rpm.

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Send for Free illustrated Bulletin DV 59

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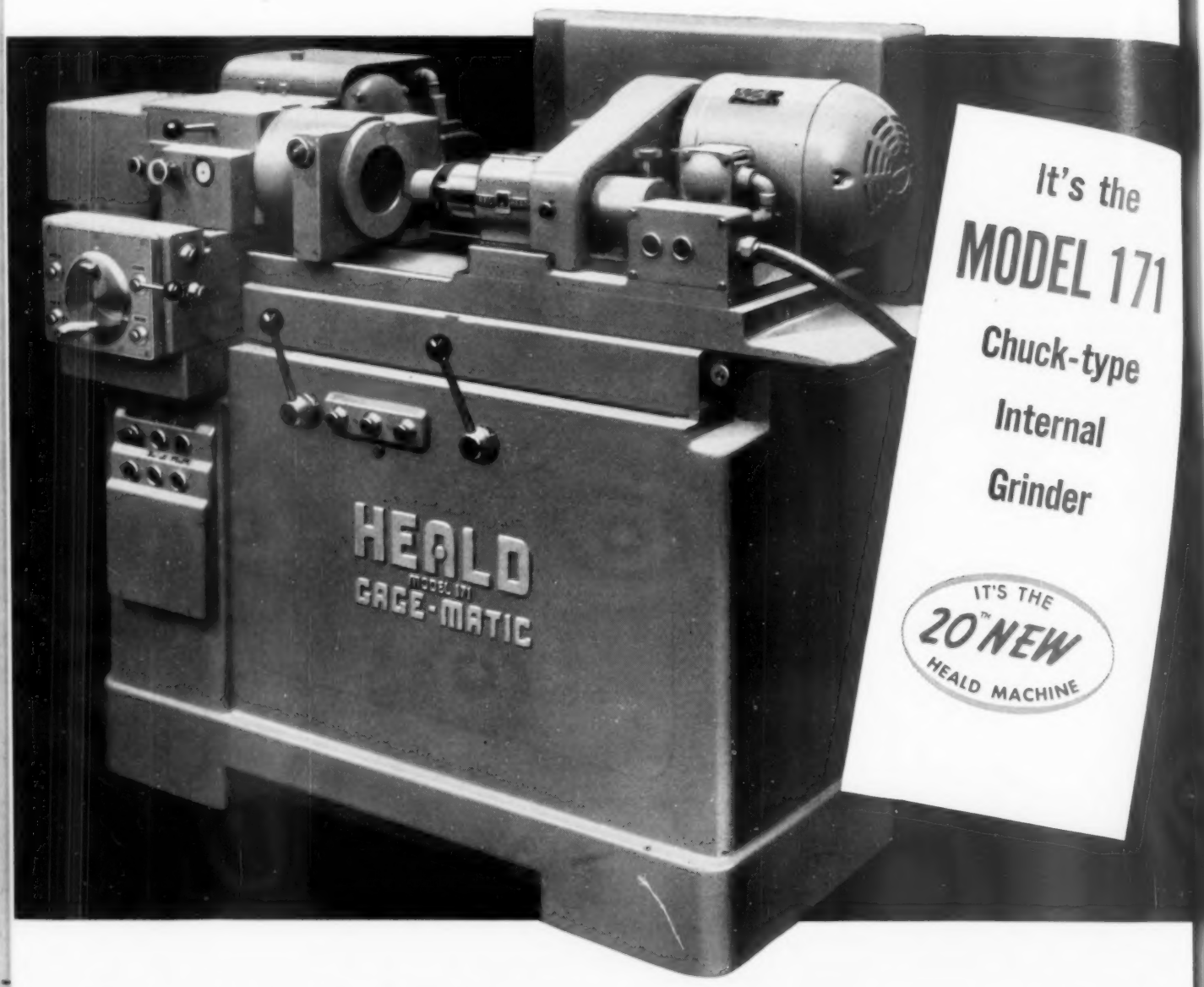
This New Addition to the Heald Line gives *NEW EFFICIENCY* in finishing small parts



With the *completely new* Heald 171, small to medium size parts can be precision ground on a mass-production basis—and with minimum effort! Grinding cycles are completely automatic once the work is loaded and the starting lever advanced. Outstanding design features include: *New Feed Mechanism—Uniform Speeds and Feeds—Sealed Hydraulic System—Centralized Controls—Anti-friction Cross-Slide—Rapid Machine Cycles—Automatic Lubrication—Isolated Power Unit.*

Like other Heald automatic internals, the 171 is available with both Size-Matic and Gage-Matic sizing, or with the Size-Matic method alone.

This latest addition to the Heald line is the result of over 20 years experience in building automatic internal grinders to meet the most exacting production requirements. Its many *new* design features assure greater precision—better finish—higher production—less operator fatigue—and easier maintenance.

For complete information, get in touch with your nearest Heald branch office—or, better still, come to Worcester and see for yourself.

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Checks ordinary bores better and quicker than cylindrical plugs

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LIGHTNESS in weight, ease of handling, and definiteness of indication are giving DuBo preference among machine operators, inspection personnel and engineers.

Operates by tilting handle. Whether handle will drop freely or not is the definite, yes-or-no indication.

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Less Dressing . . . Long Production Life

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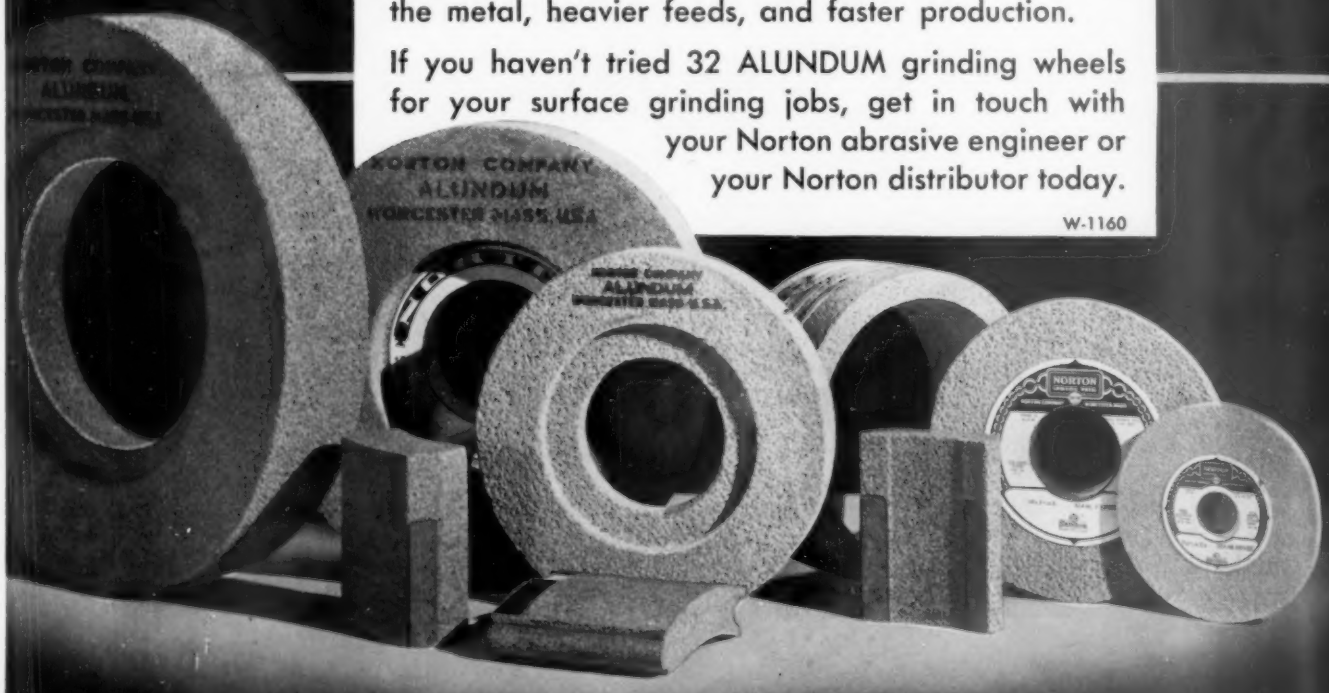
Wheels, cylinders and segments of "32" are smashing many surface grinding records because of their ability to take heavier cuts without burning. The single, complete crystals — produced by an entirely new process and over 99.6% pure useable abrasive — have many sharp cutting points **on all sides.** These sharp nubs — which resist dulling because of their high purity — act as **spearheads** for the main crystals and enable a faster, cooler penetration of the metal, heavier feeds, and faster production.

If you haven't tried 32 ALUNDUM grinding wheels for your surface grinding jobs, get in touch with your Norton abrasive engineer or your Norton distributor today.

W-1160



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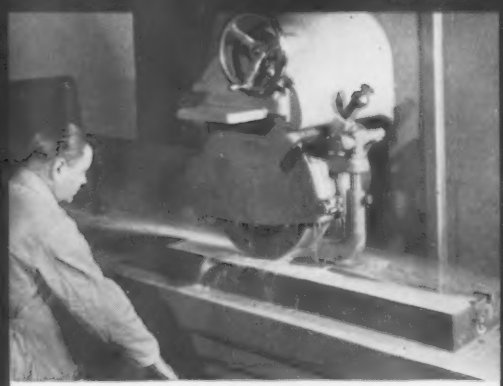
. . Outstanding for SURFACE GRINDING!

Hardened Alloy Steels
"32" wheels permit a feed **2 to 4 times heavier** than commonly used, because the singularly sharp, nubbly grains provide more cutting points. Suggested specifications: 32A60-F12VBEP or 32A46-H8VBE.

Hardened Steels
The unique, nubbly surface-sharpness of 32 **Alundum** grain insures less frictional drag and promotes a **safer, cooler-cutting action.** Suggested specifications: 32A46-I8VBE or 32A46-J5VBE.



Large Steel Parts
The long-lasting and fast-cutting properties of "32" abrasive enable these wheels **to stay sharp longer,** promoting accurate dimensional control of large flat areas. Suggested specifications: 32A36-J5VBE or 32A36-G12VBEP.

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Or, you can shave the narrower face gears diagonally at much higher production rates and with considerably less cutter wear and less effort by the operator.

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You can give the gear teeth the perfect Elliptoid form (crowning by rocking the table) while they are being shaved by either method mentioned above and without the necessity of using specially formed cutters. Special cutters may be used, however, if desired.

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PRECISION ROLLED

With MASS PRODUCTION . . .

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Actual Size, Unretouched Photos of Parts Produced.

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Small or Large Diameters

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No Cams or Linkages

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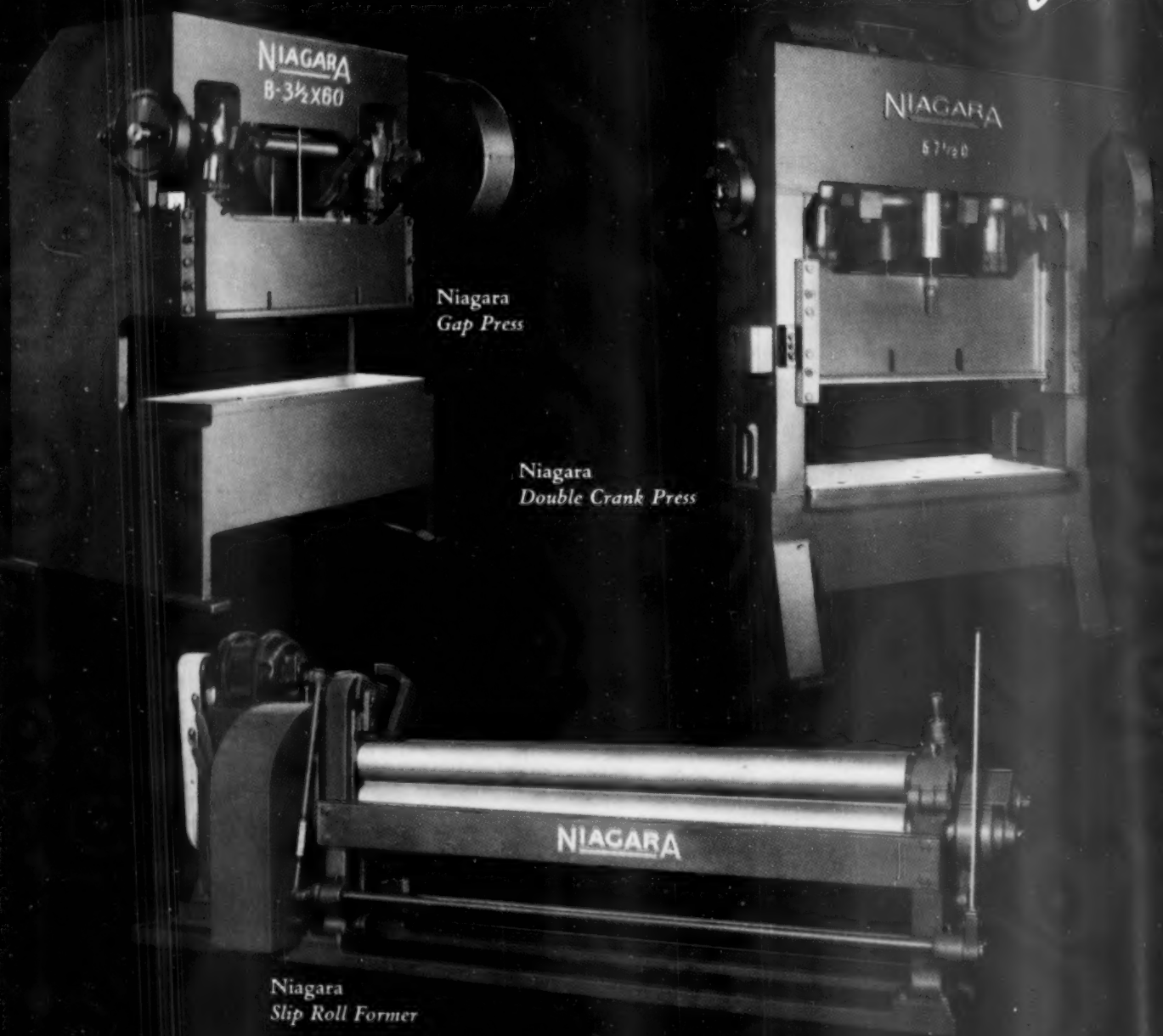

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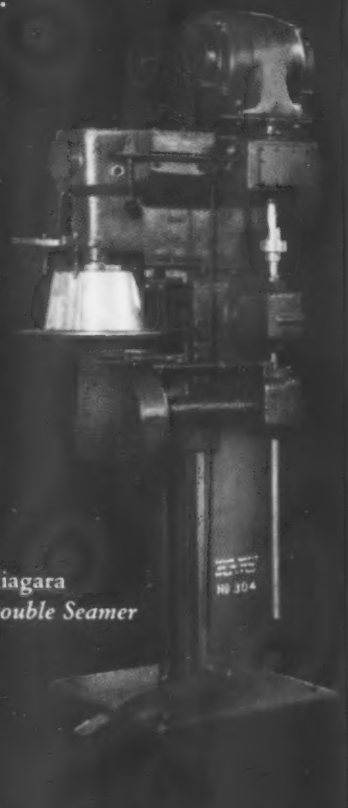

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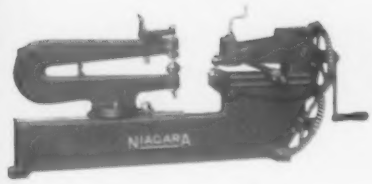

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Niagara
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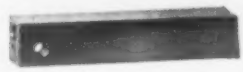

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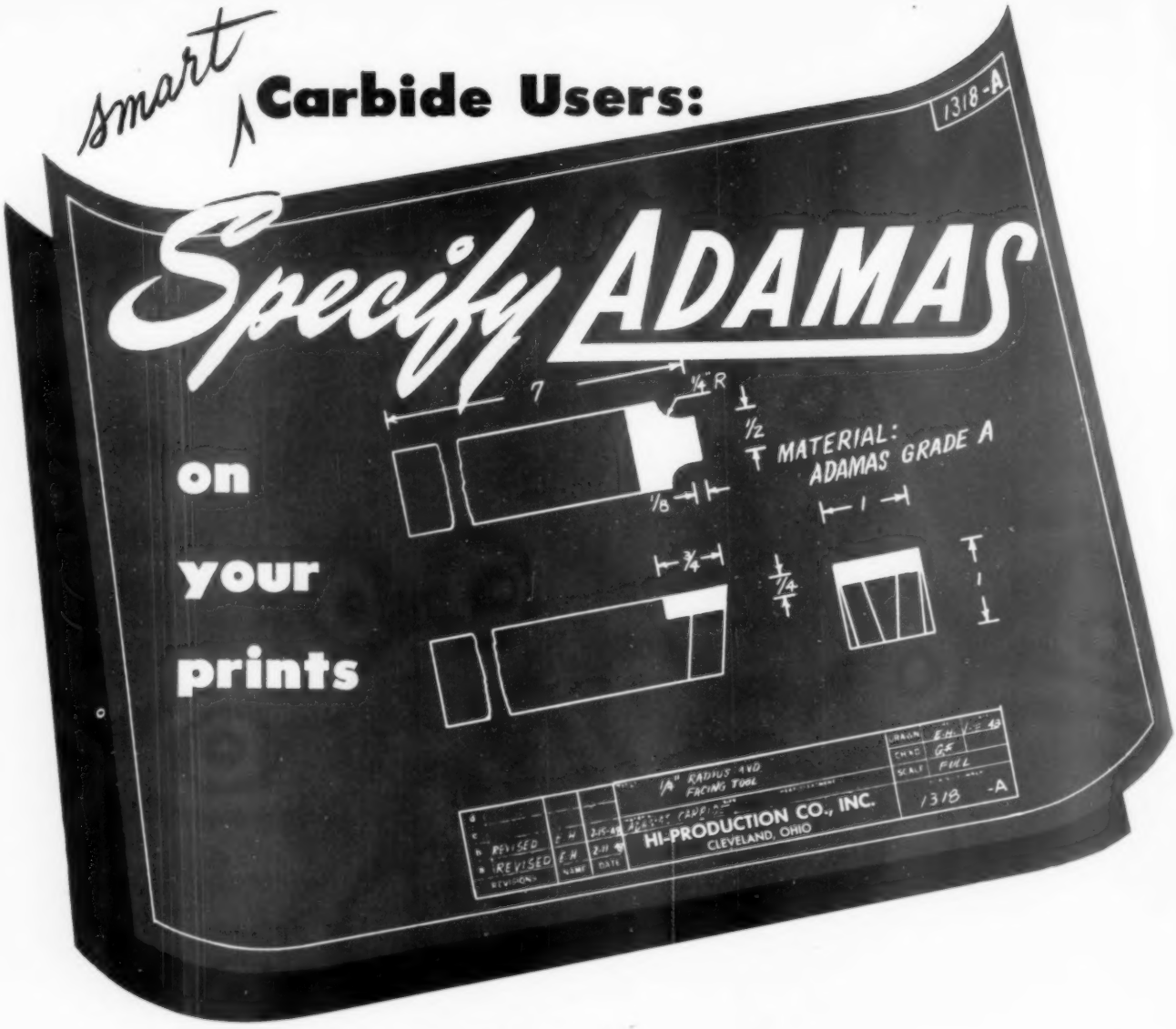

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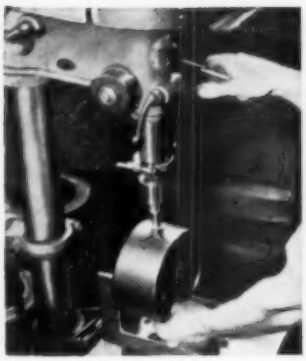
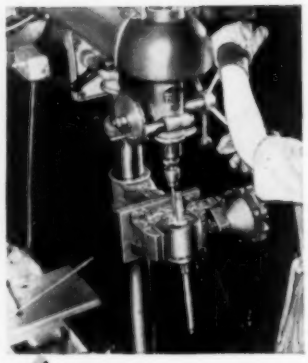
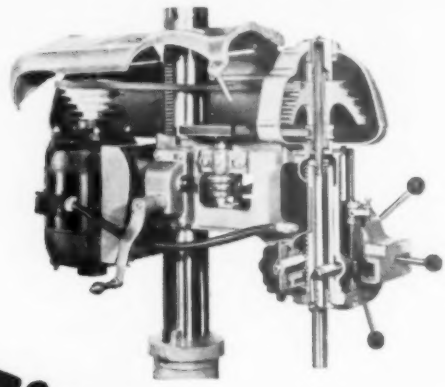




Model D-1101X. Price:
less motor and column $216.00*



FOR EXAMPLE

KINGSTON-CONLEY ELECTRIC CO.

TRIPLES PRODUCTION BY TURNING MOTOR SHAFTS

WITH WALKER-TURNER 20" POWER FEED DRILL HEADS

Demands for increased production on turning motor and grinder shafts at Kingston-Conley Electric Co., North Plainfield, N. J., necessitated replanning production equipment and methods.

Replacing five lathes with five Walker-Turner 20" Power Feed Drill Presses each equipped with a molybdenum high speed box tool containing three separate bits held with set screws and a Jacobs Chuck on each spindle, *three shaft diameters are now turned in a single operation*. Power feed controls on Drill Heads feed the work into box tools at .003" to .009" per spindle revolution. Accuracy is kept at .004" tolerance.

Results: **production tripled; man-hour costs halved.**

Taking further advantage of the broad adaptability of Walker-Turner Machine Tools, Kingston-Conley has set up 15" and 20" Drill Heads with similar ingenuity in other departments of the plant. Increases in production and job efficiency have been equally outstanding.

Variable speeds and methods of mounting and control, plus the ability to work metals, plastics or wood, are the marks of all low-cost Walker-Turner Machine Tools. *For complete catalog, write to Walker-Turner Company, Inc., Plainfield, New Jersey.*

Photo, right: Turning motor shafts on standard 20" Power Feed Drill Presses.
Photo, upper left: Spinning insulation fibre bushings over steel motor bands with 15" Drill Press.
Photo, center above: Balancing motor rotors with 15" Drill Press. Depth Gauge Indicator shows amount of metal to be removed for correct dynamic balance.
Photo, upper right: 20" Power Feed Drill Head, Model D-1101X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. Slo-speed motor optional.

*Photo, upper right: 20" Power Feed Drill Head, Model D-1101X. 4 ball bearings, 6" spindle travel. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Capacity 1" in cast iron, ¾" in steel. Slo-speed motor optional.

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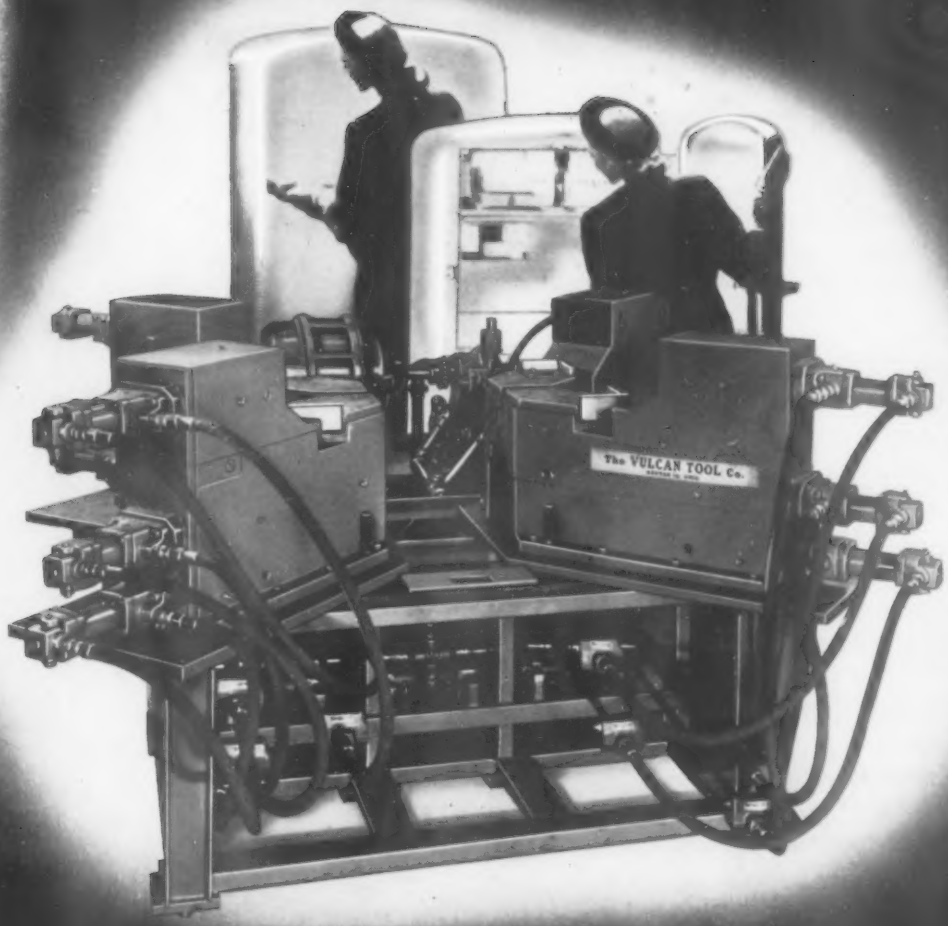

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speeds refrigerator food compartment liner production

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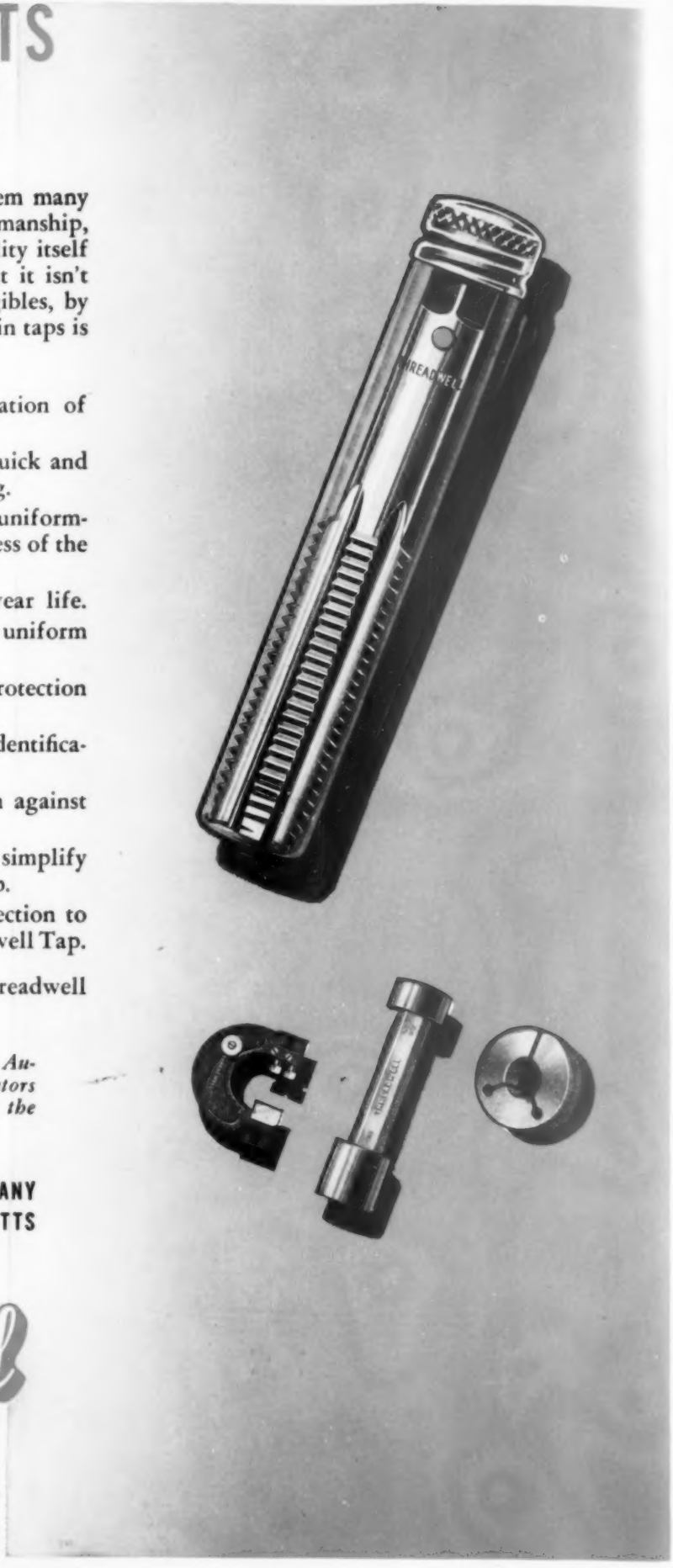

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"TOOLS OF DISTINCTION"

Analytical Determination of Radial Cam Profiles

A method of cam profile calculation and machining based on original formulae

By Gordon M. Sommer

THIS treatise on cams, which is largely limited to radial cams with straight line follower motion, is particularly applicable in shops that lack special cam machining equipment yet are occasionally required to produce very accurate cams with such basic equipment as milling machines and index heads. Properly applied and used, the formulae and data given will obviate all tedious cam layout. All basic cam curves being based on one or more mathematical curves, these formulae have been derived from the general analytical properties of the various component curves, thus providing exact dimensions of the theoretical cam shapes—a result impossible by ordinary graphic determination.

G. M. Sommer **was born in Charlesville, the Belgian Congo. Graduated from high school, in Indiana, he enrolled as co-operative student-apprentice with the Caterpillar Tractor Company, spending alternate 4-month periods at the plant and Illinois Inst. of Technology. After 30 months in the Army, he resumed full time study at Illinois Tech, then, in '46, organized a company for the manufacture of materials handling equipment. Selling out his interest in '47, he joined the Buda Company and, later, the Ace Tool Engineering Company, South Bend, Ind., as tool design engineer. He is a member of Chicago Chapter, ASTE.**

While the types of cams to be discussed have many high speed applications, others again are limited to lower speeds and the analytical method is therefore not needed. Yet others (although adaptable to high speeds) have so many limiting factors, to be considered with application, that graphic layout is necessary because the analytical method is practical only for cams with general application.

At first impression, the formulae given may appear to be too unwieldy for practicability, due to the number of times they must be applied to determine a cam profile. However, most of the factors for a given cam become constants; therefore, determination becomes quite simple once they are set up logically in table form after the original calculations are made. At any rate, it is assumed that the reader understands the graphic method; therefore, many of the important problems of cam design are not discussed because they remain unchanged regardless of the method used to determine the dimensions of the cam profile.

Determination of Points, and Notation

The number of points necessary to determine on the cam pitch surface will be dependent on both the size of the cam and the accuracy required. Generally, on small cams it will suffice to determine these points for every one to five degrees of cam rotation.

R—radius of pitch circles in inches.

S—total motion of follower in inches.

θ—angle in degrees turned through by cam during follower's total motion.

Φ or ϕ—angle in degrees formed by the straight line thru axis of follower and center of cam, and straight line between point on cam pitch surface where follower started to rise and center of cam, at any given instant during rise motion of follower.

α—assigned maximum pressure angle.

y—distance in inches from center of cam to pitch surface. The pitch surface is the path of the center of follower if follower were to revolve about the cam.

The notations given above are used generally for the discussion of all types of cam curves in this treatise. Added notation will be presented as needed.

Critical Points and Application of Formulae

The mathematical determination of the cam dimensions is frequently done with reference to critical points. These critical points occur generally when two mathematical curves are tangent, or when the cam curve is symmetric with respect to a point on the curve. The critical value of "Φ" for these curves is denoted by "Φ_c".

The formulae given are only to determine the values of "y" for points on the cam rise curve; the points on the fall curve then follow. These formulae apply only to radial cams whose follower motion is a straight line.

Whenever examples are given, unless otherwise noted, the following data will be referred to.

a. Rises 1 inch in 60 degrees turn of cam.
b. Falls 1 inch in 60 degrees turn of cam.
c. Remains stationery for 240 degrees turn of cam.
d. The maximum pressure angle to be 30 degrees.

Machining

It will be noted that the formulae given in the following chapters determine the path of the center of the cam follower about the center of the cam or, in other words, the dimensions of the pitch surface. This is necessary due to the varying "pressure angle" throughout the rise and fall cycles caused by the varying rise differential of the component portions of the cam curve. The "pressure angle" is the angle formed by the straight line through the axes of the cam and the follower, and the straight line through the axis of the follower and the point of contact at any given instant between the cam and follower.

Thus, it can be seen that the mere subtraction of the radius of the follower from the various values of "y" will not give the true dimensions of the cam. That would be true only in the case of the V-Edge follower where the radius equals zero. It is not necessary, however, to find these true cam dimensions of the rise and fall curves if the cutter used in the machining operation is the same size as the follower to be used and the proper machine setup is employed, depending upon the type of follower. (In the case of a flat follower, the cutter may be larger than the

The author extends grateful acknowledgement to Prof. S. E. Rusinoff, of the M. E. Department, Illinois Inst. of Technology, for his work in checking the calculations for the derivation of the formulas presented.

follower to be used.) Figure 3 shows the machining setup for cams having a circular or roll follower, a flat or mushroom type follower, and a V-Edge follower.

It should be noted that the value of "y" is also the distance from the center, or the face when applicable, of the cutter to the center of the spindle or arbor on which the cam blank is mounted.

The rise and fall curves of the cam are point machined, i.e., proper dimensions are set on the milling machine for a particular point while the cam blank is backed away from the cutter, then fed in and backed away again for a new setting. A continuous cut is made on the dwell portions. This method will result in a series of "high" and "low" spots on the rise and fall curves. The low spots are the proper dimensions. The high spots are filed off, resulting in a smooth continuous curve. This method is not intended for quantity production but for experimental or master cams which can be used for quantity production. If the cam is to be heat-treated, shrinkage must be anticipated; also, stock must be left for final polishing.

Cam Curves Limiting Follower Type

The base curves presented in this section produce profiles that somewhat limit the type of follower that can be used. The flat follower cannot be used with these curves. A circular follower can be used with the straight base line and the straight line combination curves but the logarithmic curve can only be used with a V-Edge follower.

Since the V-Edge follower is the only type that can be used with the logarithmic curve, the pitch surface always coincides with the periphery of this cam, and the value of "y" found by the formula presented is in all cases the distance from a point on the periphery to the center of the cam. This is true for any type curve when the V-Edge follower is used.

Straight Base Line Curve

The radius of the pitch circle is found by the following formula: $R = 57.3\ Sf/\Theta$

where "f" is the factor for a given maximum pressure angle.

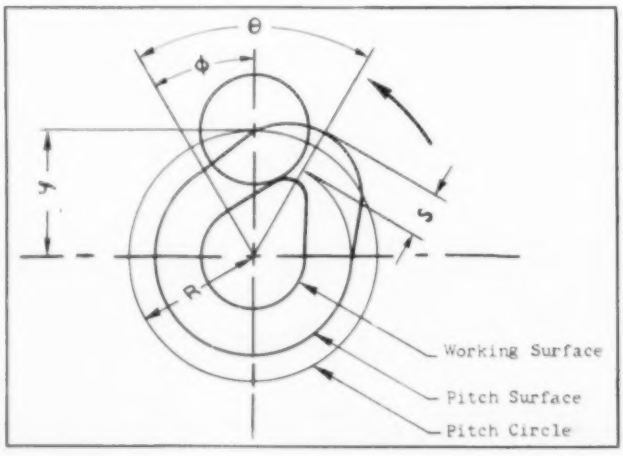
Values of "f"

Degrees	20	30	40	50	60
f	2.75	1.73	1.19	0.84	0.58

To determine values of "y" for a given value of "Φ", the following formula is applied: $y = R + \Phi S/\Theta$

EXAMPLE: $R = 57.3 \times 1 \times 1.73/60 = R = 1.650$

FIG. 1. Revolution, counter-clockwise.



To find "y" when Φ equals 3, and 6 degrees:

for $\Phi = 3°$, $y = 1.650 + 1/20 \times 1 = 1.700$

for $\Phi = 6°$, $y = 1.650 + 1/10 \times 1 = 1.750$

Straight-line Combination Curve

The straight-line combination curve is a variation of the straight base line curve that reduces somewhat the shock to the follower given by the latter curve. The curve is made up of two arcs whose radius is equal to the total rise of the follower on either end of a straight line. This combination produces increasing velocity and acceleration at the start of stroke, uniform velocity and zero acceleration during the large middle portion of the stroke, and decreasing velocity and retardation at the end.

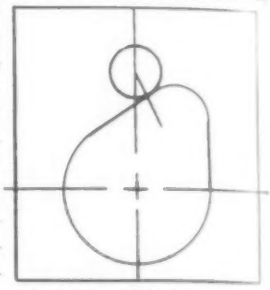


FIG. 2. Pressure angle.

Radius of the pitch circle is found by: $R = 57.3\ Sf/\Theta$

where "f" is the factor for a given pressure angle.

Values of "f"

Degrees	20	30	40	50	60
f	3.10	2.27	1.92	1.77	1.73

To determine the critical value of "Φ", apply this formula:

$$\Phi c = \Theta \sin \alpha / f$$

The value of "y" when "Φ" is less than "Φc" is found by:

$$y = R + S \cos \alpha - S \cos \left(\text{arc sin } \frac{f}{\Theta} \Phi c\right)$$

NOTE: The radius of the pitch surface when follower is at rest is equal to "y" when "Φ" is zero.

To find "y" when "Φ" is greater than "Φc" and less than "Θ — Φc":

Since this is the straight line portion of the cam curve and the velocity of the follower is constant, it is necessary to use the following formula only for the first several points in order to determine the rise differential for a given number degrees rotation of cam.

$y = (R + S \cos \alpha - S/2) - (1/2 - \Phi/\Theta)\ Sf \tan \alpha$

Then the process becomes merely one of addition for the remaining points on this portion of the curve. The above formula can be used to check any point on this portion of the curve found by the addition process.

To determine "y" when "Φ" is greater than "Θ — Φc":

Since this curve is symmetric with respect to point "C" (see Figure 5), when a point is "n" degrees less than "½Θ" and its "y" value is denoted by "y_1", the equation to determine "y" for a point "n" degrees greater than "½Θ" follows:

$$y = 2(R + S \cos \alpha) - S - y_1$$

EXAMPLE:

Radius of pitch circle: $R = 57.3 \times 1 \times 2.27/60 = 2.170$

Critical value of "Φ": $\Phi c = 60 \times 0.5/2.27 = 13.2$ degrees

To find "y" when "Φ" equals 12, 15, 48 degrees:

for $\Phi = 12$,

$y = 2.170 + 1 \times 0.866 - 1 \times \cos$ (arc sin 0.454)

$y = 2.145$

for $\Phi = 15$,

$y = 3.036 - 0.500 - 1/4 \times 1 \times 2.27 \times 0.577 = 2.209$

for $\Phi = 48$,

$y = 2 \times 3.036 - 1 - 2.145 = 2.927$

Logarithmic Curve

This cam curve is a portion of the logarithmic or equiangular spiral selected in such a way as to give the proper length of radii as called for by the cam problem. Using this curve, the pressure angle is constant and equal to the assigned pressure angle throughout the complete motion of the follower.

To determine the radius of the pitch circle, use:

$\log [(R + S)/R] = 0.00756\ \Theta \tan \alpha$

then solve for "R" in terms of "S".

To find "y" for all values of "Φ", use:

$\log f = 0.00756\ \Phi \tan \alpha$

then, $y = R\ f$

(These formulae derived directly from the analytical data used in the graphic method.)

EXAMPLE:

To find radius of pitch circle:

$\log [(R + S)/R] = 0.00756 \times 60 \times 0.577 = 0.26172$

$(R + S)/R = 1.83$

$R = 1.200$

To find "y" when "Φ" equals 3 and 15 degrees:

for $\Phi = 3$, $\log f = 0.00436 \times 3 = 0.01308$

$f = 1.03$

$y = 1.03 \times 1.2 = 1.236$

for $\Phi = 15$, $\log f = 0.00436 \times 15 = 0.06540$

$f = 1.162$

$y = 1.162 \times 1.2 = 1.394$

Curves Unlimited as to Follower Type

The cam curves discussed in this section can be used with all 3 types of followers—namely, the V-Edge, circular, and flat follower.

It should be noted that when the flat follower is used, the pressure angle factors do not apply in computing the radius of the pitch circle because the line of pressure is parallel to the line of action of the follower instead of being inclined to it as in the case of cams having a circular follower. However, a fair guide for the size of this cam may be obtained by using the formulae given for the pitch circle, assuming the 30° pressure angle factors. Extreme care should be taken when applying the flat face follower, for even though it can be used generally with these curves; limiting cases occur, and a graphic layout should be made to check this possibility.

Crank Curve

The linear representation of the crank curve is the projection of a helix onto a plane surface in such a way as to form a sine curve or sinusoid. The crank curve is sometimes called "The Harmonic Curve" because it imparts to the follower a motion similar to that of a crosshead, which is operated from a uniformly rotating crank with a T-headed or "infinite" connecting rod.

This curve gives increasing variable velocity during the first half of the stroke and decreasing variable velocity during the last half. The acceleration and retardation are also variable.

The radius of the pitch circle is found by the following formula: $R = 57.3\ Sf/\Theta$

where "f" is the factor for a given maximum pressure angle.

Values of "f"

Degrees	20	30	40	50	60
f	4.32	2.72	1.87	1.32	0.91

These factors of "f" are computed so that the assigned pressure angle occurs when the follower reaches the mid-point of its stroke. However, this curve has the characteristic of following its tangent so closely that when the linear representation is bent to form the cam, a pressure angle slightly greater than the assigned pressure angle is produced in the cam in the immediate vicinity where the center of the follower crosses the pitch circle. In the case where the assigned pressure angle is 30 degrees, an actual pressure angle of 30 deg 27 min is attained just before the cam reaches the mid-point of its stroke.

This characteristic need not be considered in normal application of this cam curve. If extreme accuracy is required in the control of the maximum pressure angle, the following formula should be applied:

$$C = 0.5\ S \Big/ \sqrt{1 + \frac{\pi}{\Theta^2} \cot^2 \alpha}$$

Here, "Θ" is expressed in radians and "C" is the amount to be added to the radius of the pitch circle determined by the previous formula.

NOTE: Theoretically, the radius of the pitch circle does not change but this approach will suffice for our computations.

To determine "y" for all values of "Φ", apply this formula:

$$y = R - S/2 \cos \left(\frac{\Phi}{\Theta}\ 180^\circ \right)$$

EXAMPLE:

To find the radius of the pitch circle:

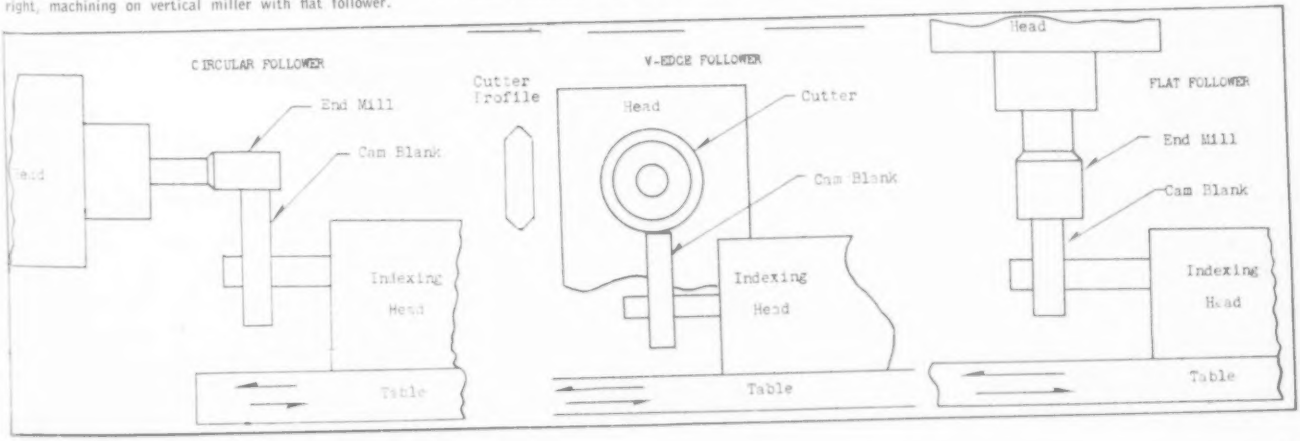
$R = 57.3 \times 1 \times 2.72/60 = 2.600$

To determine "y" when "Φ" equals 6 and 15 degrees:

for $\Phi = 6$, $y = 2.600 - \frac{1}{2} \cos 18^\circ = 2.125$

for $\Phi = 15$, $y = 2.600 - \frac{1}{2} \cos 45^\circ = 2.246$

FIG. 3. Machining setups. At left, cam milling on horizontal milling machine with circular follower; at center, cam milling on horizontal miller with V-edge follower; and at right, machining on vertical miller with flat follower.



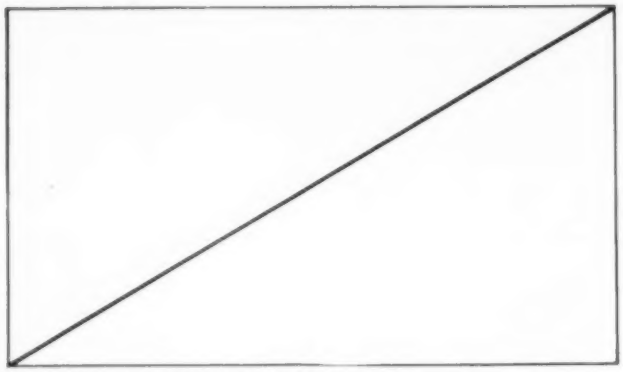


FIG. 4. Linear representation of a straight line curve.

Parabolic Curve

This cam curve is sometimes called the "curve of squares" from the fact that the rise ordinates vary as the square of the time. (See linear representation below.) If the distance between 0 and $\frac{1}{2}\Theta$ were divided into 4 equal units, the rise ordinates would be 1, 4, 9, and 16 units respectively.

The parabola is the only base curve that gives theoretically perfect motion, so far as inherent smoothness of action is concerned. It gives to the follower the same gentle motion on starting as a falling body has when starting from rest, and it brings the follower to rest at the end of its stroke with the same gentle action reversed.

Radius of the pitch circle is found by: $R = 57.3\ Sf/\Theta$
where "f" is the factor for a given maximum pressure angle.

Values of "f"

Degrees	20	30	40	50	60
f	5.50	3.46	2.38	1.68	1.15

The value of "y_1", which is the first value to be found on the cam curve, is determined by the following formulae:

$$x_1 = \tfrac{1}{2}S\phi^2/(\tfrac{1}{2}\Theta)^2$$

and, $y_1 = R - \frac{1}{2}S + x_1$

For succeeding values of "y" when "ø" is less than $\frac{1}{2}\Theta$, this formula applies: $y = R - \frac{1}{2}S + u^2x_1$
where u = "ø" at any succeeding point/"ø" at x_1

Thus, if $\frac{1}{2}\Theta$ equals 30° and values for "y" are to be found on the cam curve for every 3° of cam rotation, "ø" at "x_1" would equal 3° and when "ø" equals 15°, "u" equals 5. For values of "y" when "ø" is greater than "$\frac{1}{2}\Theta$".

Since this curve is symmetric with respect to point "C" (see drawing), when a point is "n" degrees less than "$\frac{1}{2}\Theta$" and its "y" value is denoted by "y_s", the equation to determine "y" for a point "n" degrees greater than "$\frac{1}{2}\Theta$" is as follows:

$$y = 2R - y_s$$

EXAMPLE:
To find the radius of the pitch circle:
$R = 57.3 \times 1 \times 3.46/60 = 3.304$

To find "y" when "t" equals 3, 15, 57 degrees:
for $\phi = 3$,
$x_1 = \frac{1}{2} \times 9/900 = 0.005$
$y = 3.304 - 0.500 + 0.005 = 2.809$
for $\phi = 15$,
$u = 15/3 = 5$
$y = 3.304 - 0.500 + 25 \times 0.005 = 2.929$
for $\phi = 57$,
$y = 6.608 - 2.809 = 3.799$

Elliptical Curve

An elliptical base curve can be based on ellipses with any given ratio between the major and minor axes so as to have usefulness over the entire field covered by all the other base curves. As an example, when the horizontal axis of the ellipse is zero, the elliptical base curve coincides exactly with the straight line curve. An elliptical curve based on a ratio of 7 to 4 is most widely used, therefore the formulae presented are based on these ratios.

To determine the radius of the pitch circle, apply the formula: $R = 57.3\ Sf/\Theta$
where "f" is the factor for a given maximum pressure angle.

Values of "f"

Degrees	20	30	40	50	60
f	6.25	3.95	2.75	1.95	1.35

For this cam curve, it is more convenient to calculate the values of "y" for the last portion of follower stroke and then apply the "symmetry formula" for points on the first half of the stroke.

To determine "y" when "ø" is greater than "$\frac{1}{2}\Theta$", except when $\phi = \Theta$ where $y = \frac{1}{2}S + R$:

$$y = R + \frac{7S}{8} \sin\left[\arctan\frac{4}{7} \tan\frac{180}{\Theta}\left(\phi - \frac{\Theta}{2}\right)\right]$$

To determine "y" when "ø" is less than "$\frac{1}{2}\Theta$":

Since this curve is symmetric with respect to point "E", when a point is "n" degrees greater than "$\frac{1}{2}\Theta$" and its "y" value is denoted by "y_s", then the equation to determine "y" for a point "n" degrees less than "$\frac{1}{2}\Theta$" follows:

$$y = 2R - y_s$$

EXAMPLE:

To find the radius of pitch circle:
$R = 57.3 \times 1 \times 3.95/60 = 3.772$

To find "y" when "ø" equals 15 and 45 degrees:

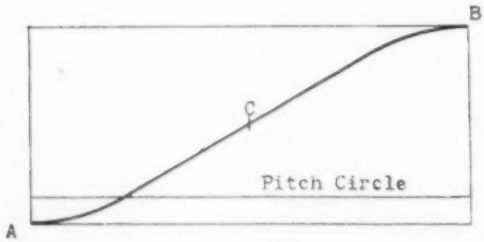
first for $\phi = 45$, $y = 3.772 + \frac{7}{8} \sin(\arctan\frac{4}{7} \tan 45°) = 4.206$

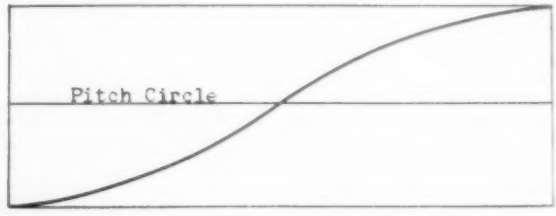
then for $\phi = 15$, $y = 7.544 - 4.206 = 3.338$

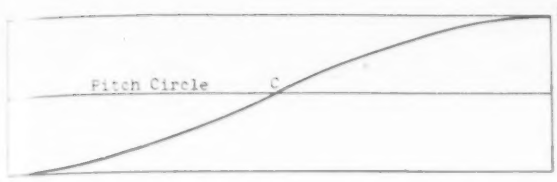
Tangential Curve

The profile shape of the tangential cam is formed by the circumference of two circles of unequal diameters, and whose centers are a given distance apart, joined by two straight

FIG. 5, at left. Linear representation of straight-line combination curve. FIG. 6, center. Logarithmic curve. FIG. 7, at right. Linear representation of crank curve.







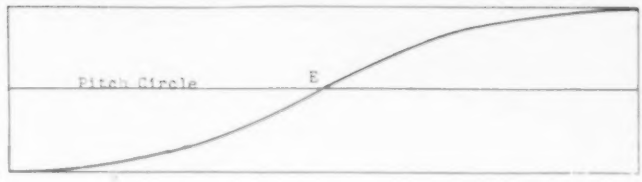


FIG. 8, at left. Linear representation of parabolic curve. FIG. 9, at right. Linear representation of elliptical curve.

tangent lines on either side. The diameters and distance between centers of the two circles are dependent upon the assigned pressure angle, the total motion of follower, and the angle of revolution of the cam through which this motion occurs.

The calculations of this cam are based on the value of "y" when the follower is at rest (in other words, the radius of the dwell surface of cam plus the radius of the follower) instead of the pitch circle as in previous curves. This value of "y" is denoted by "y_o". To determine the proper value of "y_o" for given values of "α", "Θ", and "S" the following table is used.

TABLE A

Given Degrees Rotation "Θ"	ratio of y_o to $(S-y_o)/S$				
	Assigned Pressure Angle "α"				
	20°	30°	40°	50°	60°
40°	7.56	4.75			
50°	5.90	3.72	2.55		
60°	4.77	3.00	2.06	1.45	
70°	3.93	2.47	1.70	1.20	0.82
80°	3.29	2.07	1.42	1.00	0.69
90°	2.80	1.76	1.21	0.85	0.58
100°	2.31	1.45	1.00	0.70	0.48
110°	1.93	1.21	0.83	0.58	0.40
120°	1.59	1.00	0.68	0.48	0.33

When "ϕ" is less than "α" use this formula:

$$y = y^o \sec \phi$$

The following formula applies when "ϕ" is greater than "α" except when "ϕ" equals "Θ"; then, $y = y_o + S$

$$y = \frac{e \sin \left[(180^\circ - \Theta) + \frac{\Theta}{\Theta - \alpha}(\Phi - \alpha)\right]}{\sin (\Theta - \phi)}$$

where: $e = y_o + S - \frac{y_o \tan \alpha}{\sin \Theta}$

While this cam will function properly when the radius of the follower is equal to "e", it is not altogether satisfactory as this condition will produce a sharp edge at the point of the maximum rise. For best results, the maximum radius of the follower should be $\frac{3}{4}$ e.

EXAMPLE: $y_o = 3.00 \times 1 = 3.00$

To determine "y" when "ϕ" equals 5 and 55 degrees.

when $\phi = 5^\circ$, $y = 3 \sec 5^\circ = 1.010$
when $\phi = 55^\circ$,
$e = 3 + 1 - (3 \times 0.577/0.866) = 2$
$y = 2 \sin [120^\circ + 2(25^\circ)]/\sin 5^\circ = 3.977$

Cube Base Curve (Case I.)

The cube base curve is similar to the parabola base curve, the only difference being that the ordinates, referring to the linear representation below, are cubes of the abcissas instead of squares as in the parabolic. The cube base curve gives extremely low and slow, uniformly increasing motion to the follower. The disadvantage of the cube curve however is that it gives an extremely large cam for a given maximum pressure angle, if it is used in the same way as the parabolic curve; that is, if its linear form consists of two similar arcs placed in reverse order. To remedy this, a modified cube curve is used and referred to as Case I. This modified curve retains the very low starting values of the symmetrical cube cam, and at the same time keeps down the size of the cam by using the regulation cube curve for the first half of the follower's motion and then using a short arc of another cube curve for the retardation in such a way that the maximum acceleration and retardation values shall be equal.

To determine the radius of the pitch circle:

$R = 180\ (247\ S \cot \alpha)/\pi\ \Phi$
Where the critical value of "ϕ" is: $\phi c = 0.618\ \Theta$

To determine "y" when ϕ is less than "Φc":

The value of "y_1", which is the lowest value to be found on the cam curve, is determined by the following formula:
$y_1 = R - \frac{1}{2}S + x_1$
$x_1 = \frac{1}{2}S\phi^3/0.236\ \Theta^3$

For succeeding values of "y" in this portion of the curve:
$y = R - \frac{1}{2}S + u^3 x_1$
where, $u = \phi/(\phi$ at $x_1)$

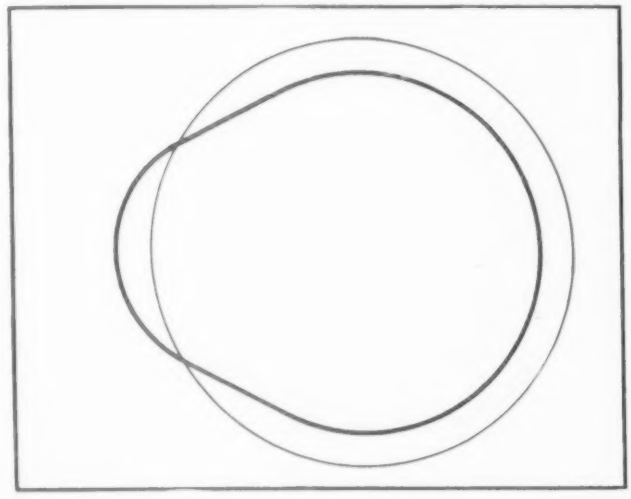
To determine "y" when "ϕ" is greater than "Φc":

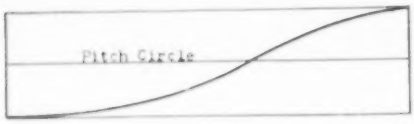
The value of "y_2", which is the highest value to be found on this portion of the curve, is determined by the following formulae: $x_2 = \frac{1}{2}S\phi^3/0.056\ \Theta^3$

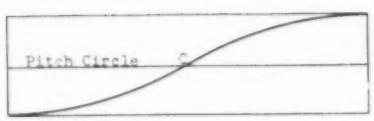
and: $y_2 = R + \frac{1}{2}S - x_2$
For preceding values of "y": $y = R + \frac{1}{2}S - u^3 x_2$
where: $u = (\Theta - \phi)/[\Theta - (t$ at $x_2)]$

Thus if $\Theta = 60^\circ$, $\phi c = 37^\circ$ and values for "y" are to be found on the cam curve for every 3° of cam rotation, "ϕ" at "x_1" equals 3° and when $\phi = 36^\circ$, $u = 12$; $\Theta = 57^\circ$ at x_2 and when $\phi = 39^\circ$, $u = 7$.

FIG. 10. Tangential curve.







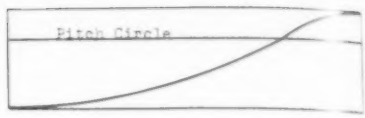


FIG. 11, at left. Linear representation of cube base curve, Case 1. FIG. 12, center. Linear representation of circular base curve, Case 1. FIG. 13, at right. Linear representation of circular base curve, Case 2.

EXAMPLE:

$$R = 180 \times 2.427 \times 1 \times 1.732/(60 + 3.14) = 4.000$$

$$\phi c = 0.618 \times 60 = 37^\circ$$

Find "y" when "ø" equals 3, 36, 39 and 57 degrees.

$$x_1 = 1/2 \times 27/0.236 \times 216000 = 0.00026$$

$\phi = 3^\circ$

$$y = 4.000 - 0.5 + 0.000 = 3.500$$

$\phi = 36^\circ$

$$u = 36/3 = 12$$

$$y = 4.000 - 0.500 + 1728 \times 0.00026 = 3.949$$

$\phi = 57^\circ$

$$x_2 = 13.5\ 12096 = 0.0011$$

$$y = 3.500 + 0.500 - 0.001 = 3.999$$

$\phi = 39^\circ$

$$u = 60 - 39/60 - 57 = 7$$

$$y = 4.000 - 343 \times 0.0011 = 3.627$$

Circular Base Curves

In the two previous sections, we were concerned with those base curves that have only one general form. In this chapter, we discuss the Circular Base Curve which has 2 general forms. Actually we discuss two distinct curves, each with different characteristics.

Circular Base Curve (Case I.)

The linear representation of this curve is composed simply of two equal circular arcs. It is the limiting case of the straight line combination curve in which the two easing-off arcs are so large as to meet and eliminate the intermediate straight line entirely.

To determine the radius of the pitch circle:

$$R = \frac{Sf}{\frac{2\pi}{\frac{360}{\theta}}} \text{ or } \frac{180\,Sf}{\pi\theta}$$

where:

$$f = 1/2(1 - \cos \alpha)$$

To determine "y" when "ø" is less than "½Θ":

$$y = R + S(f - 1/2) - Sf \cos\left(\arcsin \frac{\phi}{\theta}\right)$$

When "ø" is greater than "½Θ".

Since this curve is symmetric with respect to point "C" (see drawing), when a point is "n" degrees less than "½Θ" and its "y" value is denoted by "y_x", then the equation to determine "y" for a point "n" degrees greater than "½Θ" follows:

$$y = 2R - y_x$$

EXAMPLE:

$$f = 1/2(1 - 0.866) = 3.73$$

$$R = 3.73 \times 6/6.28 = 3.55$$

$\phi = 5^\circ$

$$y = 3.55 + (3.73 - 0.5) - 3.73 \cos (\arcsin 0.083)$$

$$y = 3.065$$

$\phi = 55^\circ$

$$y = 7.100 - 3.065 = 4.035$$

Circular Base Curve (Case II.)

In all the cam curves previously discussed, when the factors α, Θ and S are given, the portion of the motion devoted to acceleration and retardation are fixed. In this curve, the fraction of the stroke assigned to these two latter factors is variable and determined by the discretion of the designer. This curve has use in application where the change in velocity of the follower during the latter part of its travel may take place rapidly, thus the early motion of the follower may be made both very low and very gradual. The linear representation of this curve is composed of two unequal circular arcs and is in that sense a variation of Case I; however, its operation characteristics are much different.

To determine the radius of the pitch circle:

$$R = 180\ Sf/\pi\ \Theta$$

where $f = 1/2(1 - \cos \alpha)$

The critical value of "ø" is: $\phi_c = m\Theta$

where: m = fraction of stroke assigned for acceleration

To determine "y", when "ø" is less than "ϕ_c".

$$y = R - Sfm + 2Smf - 2Smf \cos\left(\arcsin \frac{\phi}{2\Theta_m}\right)$$

When "ø" is greater than "ϕ_c".

$$y = R + S(1-m) - 2S(1-m)f + 2S(1-m)\ f \cos\left[\arcsin \frac{\theta - \Phi}{2\Theta(1-m)}\right]$$

EXAMPLE:

Cam to accelerate for 0.75 of its stroke.

$$f = 1/2(1 - 0.866) = 3.73$$

$$R = 3.73 \times 6/6.28 = 3.55$$

$\phi = 5^\circ$

$$y = 3.55 - 0.75 + 5.595 \times 0.002 = 2.811$$

$\phi = 55^\circ$

$$y = 3.55 + 0.25 - 1.86 \times 0.014 = 3.774$$

By **Paul H. Winter**

Modified Geneva Drive for Hi-Speed Machines

Old principle applied to provide uniform motion and shockless acceleration

MANY SPECIAL PURPOSE production machines use a rotary index table to carry the work from loading through one or several work stations to unloading. The advantage of this type of mechanism lies in the ability of the operator to load the machine, or the fixtures mounted thereon, while work is performed on previously loaded pieces. With the addition of an automatic unloading device, such as an air-blast or a cam operated ejector, additional time savings can be further realized.

One of the best known, and most accurate, methods of automatically indexing a rotary table in equal angular amounts is the Geneva drive, shown in 3, 4 and 6-station types in Fig. 1. The rotor turns at a constant speed, and the attached driving pin enters a slot in the spider. Its continued rotation turns the latter, and the table keyed to the same shaft, until the slot is in a position where the pin leaves it to pick up the next slot on the next revolution of the rotor.

Obviously, the time interval between engagements is the time during which the table is stationary, when useful work can be performed. Since the driving pin must enter and leave its slot without interference, the centerline of the rotor through the pin must form a right angle with the centerline of each slot at the point of entry and exit.

In Fig. 1, this angle is represented by ABC in all three drives and, from the geometry of the figures, it appears that BCA is one half the angle between indexes—i.e. the fewer the indexes the larger the angle BCA and the smaller the angle CAB since this is (90° — angle BCA).

But, twice the angle CAB represents the angle the rotor makes in indexing the spider and attached table from one station to the next, and it therefore appears that the fewer the index stations the greater the ratio of available working time to indexing or unproductive time.

In the 6-station drive, for example, angle ACB is 30° and angle CAB 60°, so that the rotor turns through 120° to index the table which remains stationary for 240° of rotation of the rotor, or a ratio of productive to non-productive time of 2:1. By similar analysis in the 3-station geneva, the rotor indexes the table in 60°, leaving 300° for working time and making the ratio between productive and non-productive time 5:1. If a 2-station geneva were feasible, both angle ACB and angle CBA would be 90°, which is impossible; therefore, the minimum number of stations is 3, which arrangement is, theoretically, also the most productive.

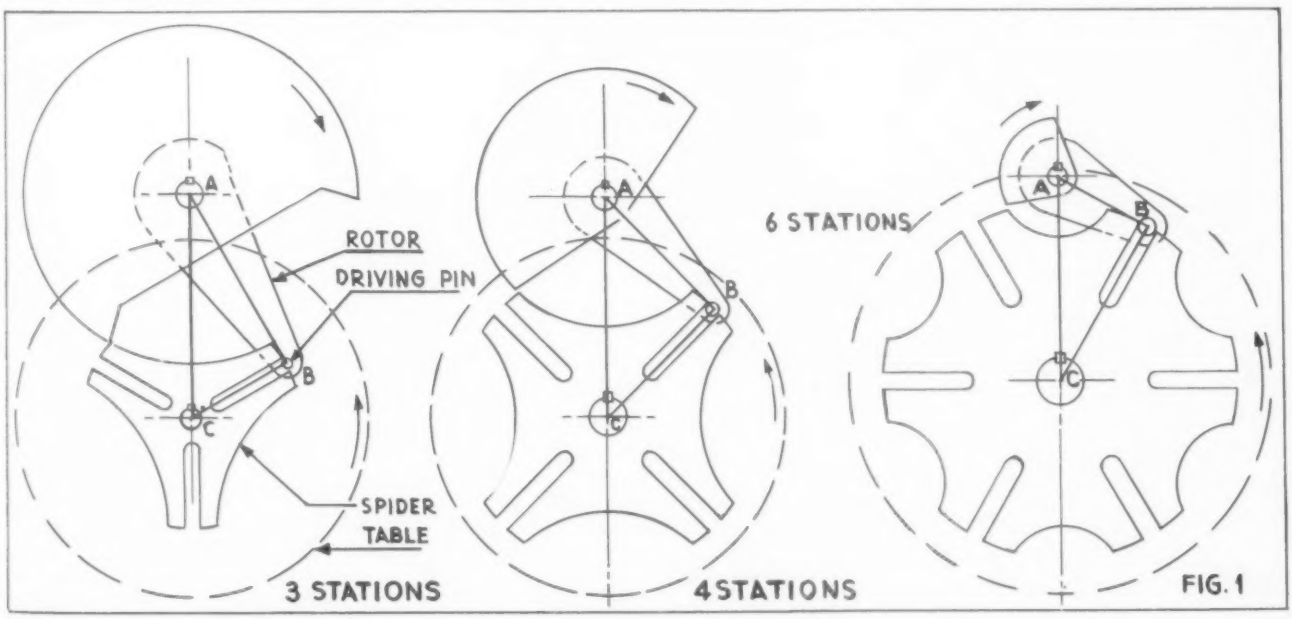
FIG. 1. On analyzing the diagrams it appears that the greater the number of index stations, the smaller the ratio of working (stationary) time to indexing time.

An Average Between Extremes

For many operations, a 3-station index would be sufficient, but many designers shy away from it because the considerable amount of angular movement of the table imposes quite a shock on the driving mechanism. Ordinarily, therefore, 4 or 6-station genevas are preferred, even if the additional station decreases the efficiency of the machine.

It is possible, however, to modify the contour of the spider slots so that the mechanism will index considerably more smoothly and it is hoped that the application of this method will see an increased use of the 3-station drive.

If the motion of the rotary table for the straight spider slot is analyzed, it will be noticed that there is very little acceleration at the beginning and a maximum of acceleration at the middle of the index. Since force is proportional to acceleration, the driving force increases from a minimum to a maximum at the center of the stroke and decreases again to a minimum. If the geneva were designed to move with constant acceleration and retardation, it would also be acted on by a constant force which would be appreciably smaller than the peak force reached with straight slots.



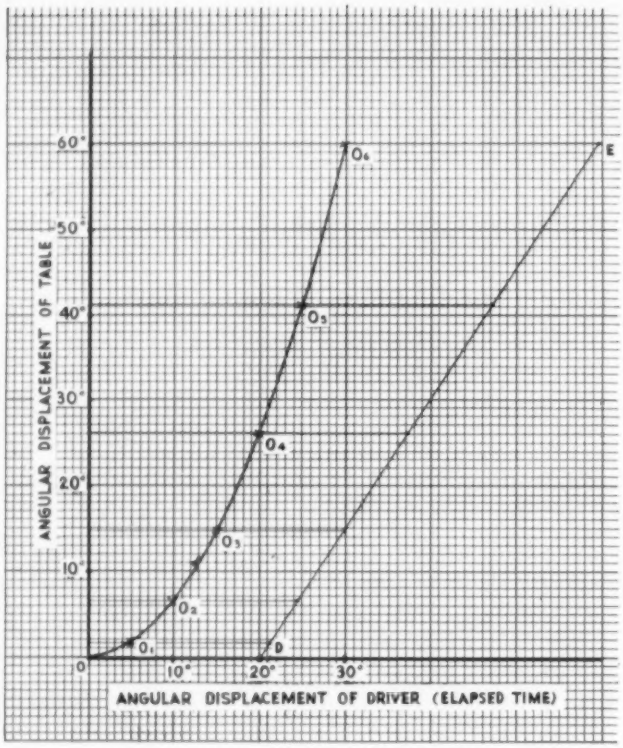


FIG. 2. The curve shows the relation between the angular movement of the driver and that of the index table that must be obtained if a 3-station geneva drive is to move with uniform acceleration. This will result in an even force being applied to the mechanism.

Because the first step is to determine how the rotary table would have to move if acted upon by a constant force, we shall construct a curve (Fig. 2) showing the desired angular displacement of the rotary table plotted against the angular displacement of the driving rotor. Since the movement, from the start to the center position of the index, is the same as from the center to the end it will only be required to consider the first half of the index, or 60°.

Because the driver rotates at a constant angular velocity, so that its displacement is proportional to the time elapsed, we may therefore consider the scale showing the angular displacement of the driver as also representing time. For our purposes, it will be sufficiently accurate to obtain points on the curve for every 5° of rotor displacement.

From the laws of motion, we know that a body, moving with constant acceleration, will in equal successive time intervals cover distances that are proportional to 1, 3, 5, 7, 9, 11, and so on. Since we are considering six successive time intervals (during which the driving rotor moves 30° and the table 60°), we pick an arbitrary length DE of 36 units on our graph, representing the $1 + 3 + 5 + 7 + 9 + 11 = 36$ spaces moved through under constant acceleration in six equal successive time intervals.

We then slope this line DE so that its end points are on the 0° and 60° lines of the table displacement scale. Now, step off one space on line DE and project it horizontally to intersect with the vertical projection of the 5° point on the driving rotor scale. This produces point 0_1. Step off three additional spaces on DE and project as before to intersect with the projection of the 10° point on the driving rotor scale. Repeat this procedure for every 5° of the driving rotor scale until a smooth curve through the resulting points 0_1 0_2 0_3 0_4 0_5 e represents the relation of the position of the table to the rotor for constantly accelerated motion.

To transfer this curve into an actual design, we will have to lay out the center points of the actual rotor and table, as shown by points A and C in Fig. 3. AB represents the effective radius of the rotor and BMN the arc through which the driving pin moves in indexing the table about point C. At the point of engagement B, angle CAB is 30° as shown in Fig. 1.

Dividing this angle into six 5° steps, we obtain the lines AF, AG, AH, AK, AL, AM, where F, G, H, K, L, M, are the points of intersection with arc BMN. Now refer to the graph, Fig. 2. For the first 5° displacement of the rotor, the curve shows a 1½° displacement of the table; for a 10° rotor displacement, we obtain a 6½° table displacement, and so on. Draw lines CP, CQ, CR, CS, CT, so that angle BCP represents the 1½° table displacement, angle BCQ the 6½° displacement and so on for the other values obtained from the graph up to the full 60° table displacement.

If the table were driven by means of a spider with straight slots, for an angular rotor displacement of BAF, the table would have moved through an angle of BCF instead of BCP; for an angular displacement of the rotor of BAG, the table would have moved through an angle of BCG instead of BCQ and so on.

Now, draw the perpendicular on PC through F, on QC through G, on RC through H, on SC through K, on TC through L, and call the resulting points F_1, G_1, H_1, K_1, and L_1. Distances FF_1, GG_1, HH_1, KK_1, LL_1, represent the distances by which the table must deviate at the selected points from the motion imparted by straight spider slots to move with uniform acceleration. Note that at M the two motions coincide.

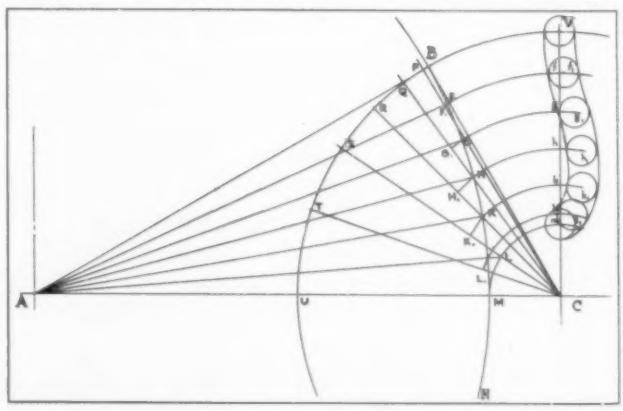
Draw a radial line CV and swing arcs with radii CF, CG, CH, CK, CL, CM, to intersect it at points f, g, h, l, m. Step off FF_1 from f along the arc FF opposite to the direction of rotation of the table; GG_1 from g along the arc Gg and so on obtaining points f_1, g_1, h_1, k_1, l_1, m_1 since the uniformly accelerated and the straight slot motion at m are identical.

With points V, f_1, g_1, h_1, k_1, l_1, m, as centers, draw circles of the same diameter as the driving pin of the rotor and draw the two tangent curves to these circles. These curves represent the shape of the driving slots that will impart uniformly accelerated and retarded motion to a three-station geneva drive, if spaced 120° in the driven spider. And while more difficult to machine, they will pay for themselves in increased smoothness with resultant higher operating speed and gain in output.

To prove that, for uniform acceleration, the distances covered in equal successive time intervals are proportional to 1, 3, 5, 7, 9, 11, and so on:

From the laws of motion we know that $s = \frac{1}{2}\,at^2$, in which s is the space covered, a the acceleration, and t the time elapsed. Let T be one unit of time. After T, the distance covered is then $\frac{1}{2}T^2$; after 2T the distance is $\frac{1}{2}(4T^2)$; and after 3T the distance is $\frac{1}{2}(9T^2 1/2)$. So, the distances covered in successive time intervals are $\frac{1}{2}T$, $\frac{1}{2}(4T^2\text{-}T^2)$, $\frac{1}{2}(9T^2\text{-}4T^2)$ and so on, or proportional to 1, 3, 5.

FIG. 3. This construction utilizes the theoretical curve, shown in Fig. 2, to produce a driver slot that will produce uniform acceleration in a 3-station geneva drive.



By Philip G. Fishback

Gage Control and Measuring Techniques

A miniature "Bureau of Standards" insures dependable maintenance of precision

By the most of us, a camera is viewed merely as a gadget with which to take photographs. Few of us, however, stop to consider that in order to bring about the foregoing results, the camera (aside from being equipped with an optically ground lens) must also be provided with a "shutter," either gear driven or activated by some other means—as in a "focal plane" type of shutter—and so constructed that a minute movement of a small lever, or a slight turn of a small knob, must "set" or regulate the speed with which this shutter operates in making the exposure.

The operating speed of the shutter functions within any desired time period, ranging from one second to a one thousandth part of a second, and does so, year after year without benefit of any greasing or oil change. Often, the actuating mechanism of this shutter is coupled to a "flash gun," which must "explode," not only simultaneously, but in such perfect synchronization that the peak of illumination, resulting from this explosion (lasting about one thirtieth of a second), must occur during that infinitesimal fraction of a second during which the shutter is wide open. Only under such a condition can the best results be achieved.

The average camera is also equipped with a "range finder" consisting of a series of prisms, at least one of which is movable and synchronized with the longitudinal movement of the lens to establish true and perfect "focus." Also, with numerous accessories, such as plate or film holders and film magazines having provisions for easy, quick attachment to, or detachment from, the camera without permitting light leakage at any point, nor interference with the set focus. Any slight deviation in distance between lens and film from the distance between lens and ground glass, which latter is replaced by the film stored in the film holder, will result in a "fuzzy" and generally unsatisfactory image.

Miniature Bureau of Standards

As the foregoing are but a few minor factors required for the satisfactory function of our product, it requires no great stretch of the imagination to realize that, in order that satisfactory performance of our product be assured, extreme care and precision is required both in the manufacture and assembly of the many component parts entering into its construction. And while this article deals with inspection of camera parts, the inspection methods and control to be described is broadly applicable to the general run of precision parts manufacture.

To maintain adequate control of quality during manufacture, the use of precision measuring instruments and gages becomes a definite "must." And, in order that these gages be preserved and kept in perfect condition, a department assuming this responsibility is created, called "Gage Control."

This gage control is actually a miniature Bureau of Standards where not only minute distances are measured, but where dependable precision of the various machines, instruments and gages with which these measurements are made is maintained. In order to accomplish this, various measuring methods, some comparatively simple, others more complicated, must be devised, and it is the purpose here to outline a simplified gage control system and to show a few measuring techniques that have proven very satisfactory.

Like jigs and fixtures used in the production of parts, gages are tools whose quality governs the accuracy of work produced. In maintaining gage accuracy, a complete control of original measurement, surface finish and record of wear is necessary so that, when a gage reaches its low limit due to continuous use, it may be replaced. Thus, we eliminate use of undersized gages and acceptance of parts out of tolerance.

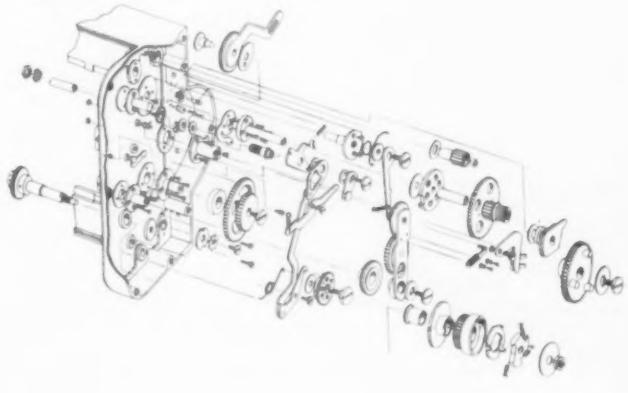
Room must be dust free

Fixed temperature is the first requisite in setting up a gage control, so, we establish a temperature controlled room where a permanent temperature, ranging between 68° and 70° F. with a relative mean humidity of 50 per cent, is maintained. To minimize the quantity of dust particles in the air, we install air filters and equip the room with a series of work benches, shelves, closets and cabinets provided with adequately divided drawers for the safe keeping and storage of all gages used throughout the plant. All this in addition to the required machines and instruments with which to retain their accuracy.

Included in our equipment, used to maintain accurate control, is a Pratt & Whitney "Super" micrometer, a number of Sheffield visual gages (we use some 5000 to 1 and others 2000 to 1), several granite surface plates, height gages and indicators, a master set of Jo blocks with which all Jo blocks used throughout the plant are calibrated, optical flats, magnasines and kindred equipment such as index heads, angle plates, cubes and so on and on. There is also a profilometer for surface measurement of gages as well as production parts.

In addition, there are complete sets of thread and gear wires, and a multitude of specially constructed automatic gages (many of them electrically operated) for use in inspection. Also, there is a Moore jig borer, for the operation of which the tool room provides a man for their own jig

Exploded view of camera mechanism



and fixture work, as well as for some of the required layout and checking for both gage as well as tool inspection.

As a safety measure as well as for conservation of space—especially in the drawers intended for storage of plug and thread gages—we cover these gages with plastic "caps," which remain on the gages during the time they are not in actual use. After a gage has been dipped in this covering compound, the latter is punctured with a small hole to permit easy removal from a plug or thread gage.

The gage is then coated with vaseline and the cover replaced, the latter absorbing a portion of the vaseline and keeping the gage amply greased to prevent rust. This procedure not only protects the measuring portion of the gage, but permits storing several gages in a drawer compartment, eliminating any chance damage should they hit one against another.

An index, showing contents of each drawer or closet, is prepared. Strip cards are used for this purpose, the faces of which should be protected by a sheet of cellophane. The cards are slipped into frames attached to the outside of drawer or closet door, the individual cards thus being easily removed whenever the contents are changed.

All that done, we compile an inventory, using for this purpose recording cards as shown in Fig. 1. Each gage has its individual card providing space for entry of such pertinent information as date received, original dimension, size and date of each inspection and by whom inspection was performed, as will be explained herein.

This record card should also have suitable space for entering such data as out-of-roundness, taper to the end, or if (on a plug gage) it has been ground down for end wear. By having this information automatically present on the record card, we have a complete case history which makes it easy to definitely determine the condition of any gage by consulting the record card in our file.

Inter-department relationship

When new or replacement gages are ordered, a Gage Requisition form, as shown in Fig. 2, is issued in triplicate by the Chief Inspector, Gage Control Chief or the Methods Department. This requisition gives the part number on which the gage is to be used, quantity desired, size, wear allowance, class, type and—if an adjustable gage—whether it is to be set by the purveyor. Also, it will indicate any special markings required, such as part numbers or standard tool numbers.

All gage requisitions are routed to the Methods Department where they are checked, and then to Purchasing where the purchase order is issued. The face of the purchase order shows all of the information given on the requisition and, after the order has been issued, the date of purchase order, from whom purchased, and purchase order number are entered on each of the three requisition blanks. One copy is returned to the Methods Department, one to Gage Control, and the third to Accounting.

This routine eliminates possible duplication of orders and Gage Control knows just what gages are on order. In ordering gages, the wear allowance is based on the Wear Allowance Table used by the Ordnance Department, and shown in the Sheffield handbook. The foregoing rule applies to all plug, ring, flush pin, snap and thread gages, the size and tolerance tables provided in Handbook H28 being strictly adhered to.

The routing of orders

With the foregoing outline of setup completed, let us now analyze the relationship between Gage Control and the rest of the plant, to see how it functions. When a part is put into production, the setup man brings the parts print to the Gage Control room and requests the desired gages. These are issued to him after the Inspection Process Card has been checked with the print information. The operator then signs for the gages, his receipt being kept in a "tickler" until the gages have been returned.

The job is set up, and the first part produced. This, together with the gage, is then submitted to First Piece Inspection, after which the gage is returned to the operator. The gage remains with the job until it is completed, both for the operator and foreman's benefit as well as that of the "roving inspector" assigned to that particular department.

There is no need of pulling gages during comparatively short runs, but where there are extended runs, gages should be checked periodically by a gage control man. After a job is completed and the setup is torn down, the gage is returned to Gage Control where it is duly credited to the operator. Before returning the gage to its storage space, however, it is the duty of Gage Control to clean it thoroughly and to recheck all measurements. These are recorded, together with the date of inspection and by whom checked, on the record card, thus keeping the case history of the gage up to date.

In the interests of maintaining quality standards throughout the plant, it has been found profitable to permit Gage Control to relap micrometers, for employees, when time permits. By offering this free service to employees, there can be no excuse for any micrometer in use, whether it be the property of the plant or of the individual employee, to be other than in top condition.

For gaging external threads, roll thread gages are definitely favored, the prime reason being that these may be set for plating allowance, thus eliminating special ring gages which are under basic as well as under basic set plugs.

At Graflex, we calibrate our regular set plug, set our gage and measure the distance between rolls with Jo blocks, subtracting from this measurement the amount of plating allowance desired, then set the rolls that much closer together. If, at any time, difficulties arise in the threading operation, Gage Control checks the thread gages for lead angle and pitch diameter error. In the event that a ring

GAGE RECORD

TYPE	DATE REC'D	LOCATION
Plug Gage Double End	3-24-46	A-19

PART. NO. G-60378 - P - 12 #1

SIZE Go .312 No Go .313

DATE CHECKED	INSPECTED BY	CONDITION	ADJUST	PRESENT SIZE
3/26/46	AC	New		.312130 -- 312990
3-30-46	AC	Go Taper .000020		.312110 -- 312985

Fig. 1

GAGE REQUISITION 1435

DATE 3/15/46 DATE WANTED 3/25/46

PRINT NO. C-50378 - P - 12

USED ON SYNCHRONIZER

USED FOR Check -- .312 - .313 - Diam. Hole

QUANTITY REQUIRED 3 Plug Gages -- Unilateral Tolerance

SIZE OR WORK TOLERANCE

	GO MEMBER	NOT GO MEMBER
SIZE	.312	.313
WEAR ALLOWANCE	+.001	0
GAGE CLASS	X	X

MEMBERS WANTED Go & No Go With Handles

TYPE MEMBERS Taper - Lock

SETTING PLUG

GAGE TO BE SET AND SEALED

MARKING INSTRUCTIONS Go .312 Not Go .313

SUPPLIER Pratt & Whitney EST COST

ORDER NO. DATE ISSUED

CLASSIFICATION	DELIVER TO	ORIGINATED BY	AUTHORIZED BY
NEW X RENEW (OUTWORN) ☐ REPLACE (DAMAGED, OPER. CHANGE) ☐ PRODUCT REDESIGN ☐	Gage Control	a.c.	

Fig 2

gage must be checked, a cast is made from the gage and this cast is checked.

If everything is found to be within the standards established by Handbook H28, sample parts that may be in question are checked optically for lead and angle error, and with the resulting information we can investigate chasers and threading tools. The final results are then turned over to the chief inspector for his disposition, as well as to the superintendent of the metals department; thus, Gage Control renders a service to both.

All gages are numbered

On adjustable snap gages, each size frame (on some sizes we have as many as 50 or more) is individually numbered, in sequence, beginning with No. 1, 2, 3 and so on. In the cabinet providing storage for these, separate compartments are arranged to accommodate one frame each, and these compartments or bins are numbered with the corresponding number of the frame resting therein.

The gage and its range are specified on the record card, the cards for all unset gages being filed numerically, according to range. When the gage is set for any particular job or size, its card is removed from the file and the size at which it is being set, date and by whom, is entered thereon. The card is then returned to that section of our file containing previously set snap gages, which are filed according to size.

In other words, we have a double file system for snap gages. By way of demonstration, the following is a step by step procedure: Say that a snap gage is required for a .250″ + .003″ tolerance. The gage control attendant first looks through his dimensional record file, and, failing to find a gage already set to the required dimensions, removes one of the unset frames—say a No. 21 of the series within the required range—from his bin. He also removes its record card (also No. 21) and sets the gage to the required dimensions and seals it. He then attaches a tag to the gage, specifying the dimensions to which it has been set and records this data on his record card, issues the gage to the operator, files the receipt in the "tickler", and also files the record card according to the size the gage has been set to.

All gages checked on return

When the gage is returned, it is checked dimensionally for wear. The seal remains unbroken and the dimension check is entered on the record card, together with date and by whom checked. The record card is returned to the dimensional file, and the gage restored to bin No. 21. Thus, if a snap gage of the same dimensions is required in the near future, the gage may be re-issued and, if necessary, may be reset at that time. The foregoing simple procedure eliminates a great deal of confusion.

When a visual gage or comparator is issued, the gage control man sets it, records the transaction on his record card and, after it is installed at the job—usually on a bench near the machine—rechecks the setting and leaves the necessary gage blocks for periodic rechecking with the machine. However, it becomes his duty to recheck the instrument periodically.

In checking spur gears, we use a composite error system which has proven very satisfactory for setting up gear cutters and for readily detecting any possible error in the generator set up before the run is in progress. The equipment consists of a base on which two arbors are mounted, one stationary, the other movable, not radially but longitudinally in a slide provided on the base. The movable arbor is spring actuated, providing a variable adjustment to maintain the desired pressure in the direction of the stationary arbor. On this movable arbor we mount our Master Gear, which is correct within .0002″ as to run out, spacing and parallelism of teeth and contour. The master gear is calibrated to its pitch diameter which, divided by two, gives the

SPUR GEAR DATA	
ADDENDUM	EQUAL
No. OF TEETH	20
CUTTER DIAMETRAL PITCH	64
CUTTER PRESSURE ANGLE	14½°
PITCH DIA.	.312
WHOLE DEPTH	.0337
MESHES WITH B50304P82	
CHECKING DATA	
CENTER DISTANCE RADIUS	.156
MAXIMUM COMPOSITE TOOTH ERROR (VARIATION TOOTH TO TOOTH)	.0009
TOTAL COMPOSITE ERROR (VARIATION IN 360°)	.0024
MAXIMUM IND. READING	-.0010
MINIMUM IND. READING	-.0045

Fig. 3

center distance radius. We then refer to the parts print, which shows a spur gear data table as shown in Fig. 3, giving full information as to addendum, whether equal or unequal—such as either "long addendum" or "short addendum"—the number of teeth, the diametrical pitch of the cutter, the cutter pressure angle, the pitch diameter (which is theoretical), the whole depth of the tooth and the mating gear part number. Thus, we have all the information for the setup of the gear cutter or generator.

In a lower column, we have the center distance radius (which is one-half of the theoretical pitch diameter), the maximum composite tooth error or variation from tooth to tooth, which is given in tenths and determines the permissable movement of the indicator reading from tooth to tooth. For our purposes, the total composite error variation in 360°, the maximum allowable error in a full rotation of the work gear, and the maximum as well as minimum indicator readings are always minus, assuring backlash.

A typical example

To demonstrate the complete procedure, take the example shown in Fig. 4: Selecting the gear whose data appears in the table, Fig. 3, which has a center distance radius of .156", the maximum comopsite tooth to tooth error is .0009", the total composite error is .0024", the maximum indicator reading is a minus .001", and the minimum indicator reading is a minus .0045".

We add the center distance radii of our master gear and work gear and subtract from the sum one-half of the sum of the diameters of both arbors and set up Jo blocks to this dimension, placing them between the two arbors. We then bring the arbors together until the indicator hand registers zero, which gives us the theoretical center distance of the two gears.

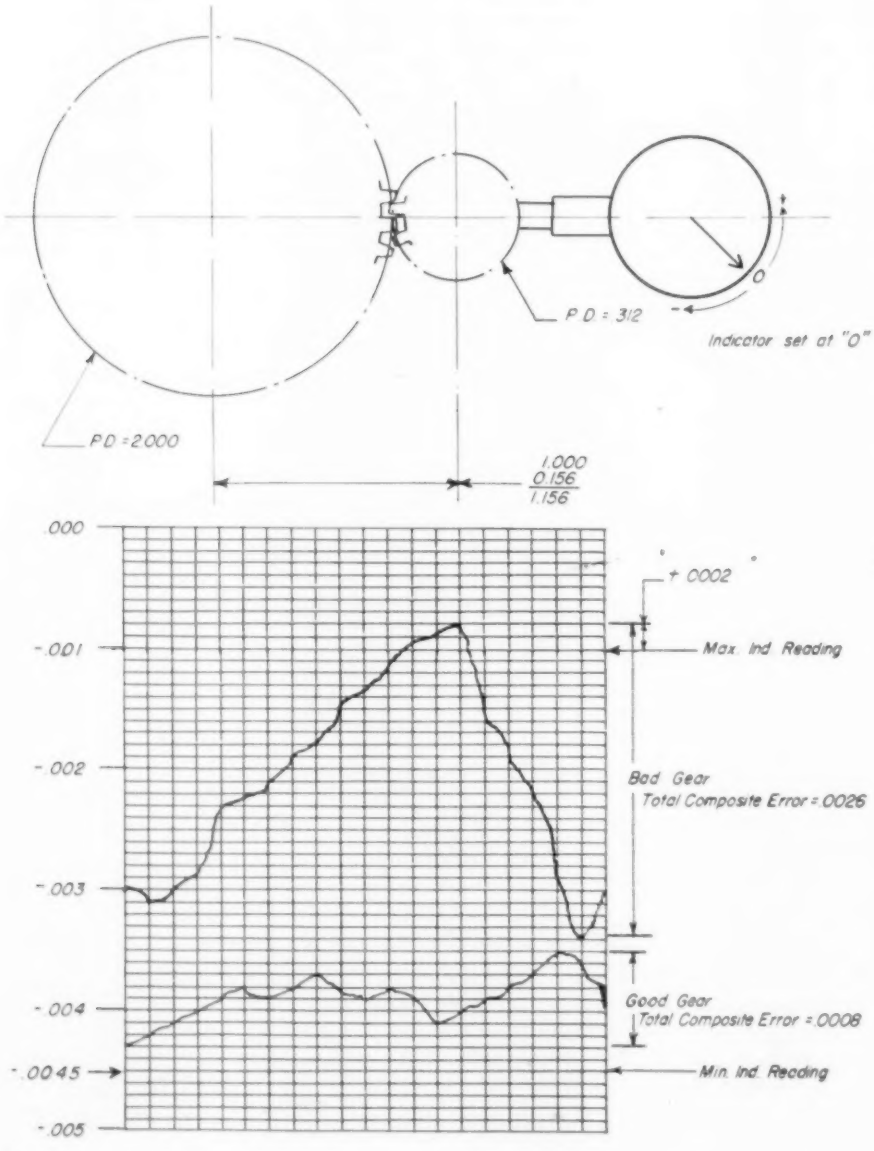
We now draw two red lines on our indicator dial, one line at the minus .001" graduation, the other line at the minus .0045" thousandth graduation, thereby establishing our limits. This distance established, we now set the required spring pressure as supplied by engineering on their data sheet, this pressure being based on the diametrical pitch as well as the pitch diameter of the gear being checked. After our apparatus has been thus set and checked, it is ready for the operator, the Jo blocks being left with the equipment for future recalibration should this become necessary.

In order to better analyze this procedure, study the graph accompanying Fig. 4. From the horizontal line across the top, which is labeled zero, we use a scale representing one square per ten thousandths of any inch, moving downward ten squares—or .001"—and draw another horizontal line which represents the high limit of the gear. From this second line we move downward 45 squares, or .0045", drawing another horizontal line representing the low limit of our gear. Thus, when we draw our sine waves for tooth variations, they must fall within these lines.

To eliminate acceptance of a gear running from the extreme low to the extreme high limits, we have a total composite error of .0024". At no time should the sine wave cover a vertical area greater than this amount; thus, if a gear starts on the low limit, it can only go upward to minus .0024", giving our control for concentricity as well as error in spacing.

Should the gear start at the high limit, it can go as low as .0003" or .0004" but can never have an error of eccentricity of more than .0024". Although we allow an error in pitch radius of .0035" in this tolerance, we include all run out as well as tooth spacing. We can absorb the tolerance with the pitch radius error but, if the arbor or collet on the gear generator has a high runout error, we are restricted on the pitch radius error. So regardless of the pitch radius or concentricity error—i.e., if held within the total composite error and within the maximum and minimum indicator readings—we are assured that our gears will neither bind nor have excessive backlash when mounted in a gear train.

The first work gear checked will show the condition of setup of the gear generator arbor for concentricity and allowable play between arbor and gear bore, including out-of-roundness, taper or bell mouth. Thus, when Gage Control supplies the inspector with a set-



up such as described, gears may be checked with extreme rapidity, thereby enabling acceptance or rejection based on positive tolerance requirements.

While our spur gear blank dimension control is comparatively simple, since micrometers, snap gages or Sheffield visual gages quickly determining O. D. and other basic measurement accuracy, bevel gear blanks present a more complex problem. For here, aside from dimensions readily checked by the tools enumerated above, we have three distinct dimensions, each of major importance, where the above tools are insufficient.

Positive control of major diameter, face angle and the relationship between face angle and mounting surface of the gear must be maintained. It must be remembered that, irrespective of how perfectly a setup on the gear generator checks with the master gear, there can be no interchangeability between bevel gears and pinions from one lot with those of another lot unless the gear blanks are true and uniform. As we do not wish to sacrifice this interchangeability, we are compelled to pair mated gears, keeping such new sets together in order to avoid trouble by unsatisfactory performance of mismated gears. Obviously, then, these important dimensions should be checked.

So, while we check finished gears in either a hand or power rolling machine in mesh with our master gear, we must not forget that even with perfect setup in our gear generator, the finished gear quality nevertheless reflects the perfections or imperfections of our gear blanks. Hence, a spot check at least of these gear blanks will prove an important factor in the quality of gears produced.

Simple tool setup

To accomplish this spot checking without use of special equipment, several checking methods have been devised. However, the setup as shown in Fig. 5 which is both safe and simple, requiring no other tools than a surface plate, a heighth gage and indicator, a V-block, a sine bar, an arbor and Jo blocks.

In preparing a setup for measuring the face angle location in relationship to the mounting surface of the gear, as demonstrated in Fig. 5, we proceed as follows:

After strapping our V block, with arbor, to the sine bar, we set the latter horizontally on our surface plate so that the arbor will be in a vertical position. We then measure from the top surface of the V block down to the center of the roll on our sine bar, as shown by measurement "A". This represents the location of the mounting face of the gear.

We next set our sine bar in a vertical position, taking the measurement from the center of the arbor to the center of the lower roll of the sine bar, giving us measurement "B", representing the axis of our gear.

Having secured these two measurements, we now set up our sine bar at the face angle of the gear, which is obtained from the information given on the bevel gear drawing. By taking the cosine of this angle, and multiplying it by the center distance "L" of the sine bar rolls, we derive "H". This is the dimension to which we set our Jo blocks, which are placed under the far roll of the sine bar as shown in Fig. 5.

Then we add measurement "A" to measurement "C" (the mounting distance derived from the gear data shown on the print) and multiply this sum by the sine of the face angle. To this resulting product, we add "B" times the cosine of the face angle, and add measurement "R" (the radius of the sine bar roll) to the resulting sum, which total sum gives us the checking measurement distance "M".

We now make a second Jo block setup to this dimension, to which we set our heighth gage and indicator, with our indicator reading at zero. Placing a gear blank on the arbor in the V block, we use the heighth gage and indicator as a comparator type of gage, thus spot checking our gear blanks by means of this setup.

When Gage Control supplies such a setup, the operator or inspector will have little difficulty in maintaining gear blank quality after dimensions other than the face angle and mounting face have been checked with micrometers or snap gage. The required interchangeability of gears will result regardless of when the lot was produced.

A novel radius gage

While the foregoing procedure shows only one of the simplified methods of checking production parts where no fixture gage is available, kindred procedures may be laid out for the checking of special purpose gages which fall beyond the scope of equipment on hand. And while the equipment enumerated in the beginning of this article is quite sufficient for ordinary gage checking requirements, occasions will arise where this equipment must be augmented although, as a rule, only minor additions will be found necessary.

Take, for example, a radius gage of relatively large dimension, having the point from which the arc is swung, in mid air, thus eliminating any concrete reference or checking point from which to begin our check. A quite simple way of solving such a problem employs only available equipment such as a surface plate, an angle plate, heighth gage and indicator, Jo blocks and six cylindrical plugs of equal size, (standard die makers dowel pins will suffice). With this equipment, plotting the definite curve or arc in question is comparatively easy and can be accomplished in a very short period of time. The principle employed, and the procedure, is shown in Fig. 6.

This layout illustrates a checking procedure for a double purpose gage, wherewith both size of radius as well as the relationship between this radius and a hole bored in the part is to be checked.

In the absence of a special fixture gage, and with a surface plate as a base, the gage is clamped on an angle plate so that the cylindrical plug (used for checking the bore location) is in a vertical position. We then locate two rolls of equal diameter—such as die maker's dowel pins—tangent to

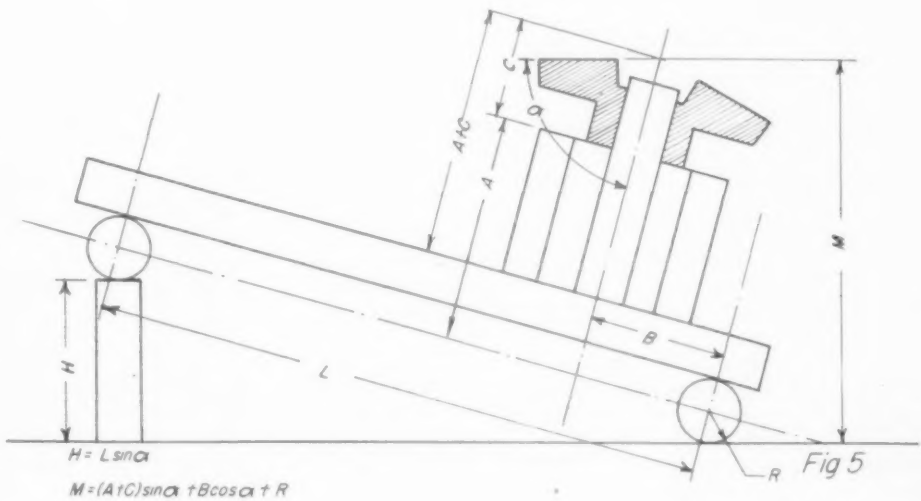


Fig 5

the cylindrical plug and radius. By adding the radius dimension of the cylindrical plug to the radius of one of our rolls, we obtain dimension "Y".

We now locate two additional rolls of identical diameter at a pre-determined center distance (Y') from each side of the axis of the cylindrical plug, checking these distances by means of Jo blocks, and place the rolls tangent to the radius. The "predetermined distance" may be at any desired measurement, but preferably at an even number for greater ease in computing subsequent calculations.

Taking a third pair of rolls of like diameter, we duplicate our former procedure and locate these tangent to the radius at another pre-determined distance (Y) from the axis of our cylindrical plug, as shown in Fig. 6. Obtaining radius "R" from the gage print, we add to this dimension the radius of one of our rolls (r), thus deriving measurement R r.

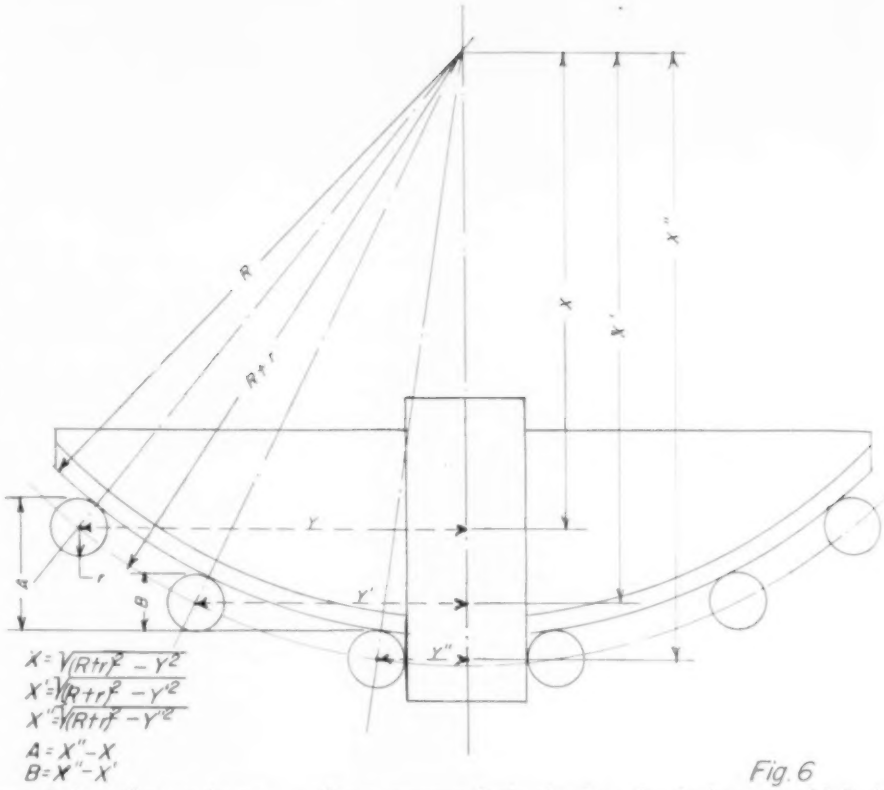


Fig. 6

On studying the layout, it becomes obvious that we have created three right triangles with the hypothenuse of each of these represented by R r, and the known adjacent sides respectively represented by dimensions Y, Y', and Y", and the calculating dimensions X, X' and X" for the remaining sides of these three triangles. Now, referring to our formula, we find that X equals the square root of R r square minus Y square. To determine X' we substiute Y' for Y, and to find X" we substitute Y" for Y.

We now obtain our first checking dimension "A", which is the vertical distance between the top of our lowest roll and the top of our highest roll, by substracting X from X". To obtain checking dimension "B", we subtract X' from X", and then check both of these dimensions with heighth gage and indicator to determine whether our rolls fall within the correct radius dimension given on the print. Following this procedure, the checking of such a gage is a simple matter regardless of the size of the gage, since the same formula applies.

Rolls may be employed to check many dimensions where special fixture gages are not available, thus making inspection a comparatively simple task. And we are chiefly interested in determining as well as maintaining accuracy of dimensioning tools, and doing so economically. In other words, Gage Control is vested with the responsibility of supplying measuring tools—or methods—of unquestionable accuracy whenever and wherever these may be required in either production or inspection, so that inaccuracies may be discovered before they develop. Aside from eliminating waste of both time and material in the process of manufacture, the result is better service to the ultimate user.

And, regardless of what procedure we adopt in maintaining this required precision, an equally important factor resides in keeping up-to-the-minute records of measuring tool conditions. For only when the status quo of any of the tools and instruments under its jurisdiction is automatically present and readily available from its reference library, rather than from the re-inspection of the gage in question at the moment it is needed, does Gage Control render complete service to the manufacturing process for which it was created.

Stinson '48 Flying Station Wagon makes its bow to the Flying Public

A vehicle that should appeal to our many air-minded tool engineers is the '48 Stinson Flying Station Wagon, one of two 4-place personal planes now in production at the Stinson Div'n of Consolidated Vultee Aircraft Corp'n, Wayne, Michigan. The other model is the Stinson Voyager. The seaplanes, which are powered with 6-cylinder 165 HP engines, are said to take off (fully loaded at 2500 pounds) in 36 to 40 seconds with no wind depending on type of prop used.

According to the maker, the seaplanes do not require the customary auxiliary fin. This is unique in personal aviation and is achieved through successful development of a larger vertical stabilizer and dorsal fin, in the new models, which provide remarkable stability. The planes have been certified by the Civil Aeronautics Administration for seaplane operation, having previously been approved by the CAA for operation on wheels, skids and cross wind landing gear. Range is said to be over 500 miles.

By J. F. Libsch and R. D. Guess

Selective Hardening Of Wear Surfaces

High frequency heating provides the right heat at the right place to provide maximum strength and surface hardness

THE DESIGN OF SMALL STEEL PARTS is frequently complicated by the necessity for providing, in a single part, both maximum toughness to resist severe impact loads and maximum hardness in a surface of the part which is subject to sliding contact with other parts. Such a wear surface, for example, should exhibit maximum hardness to resist wear; but, full hardness on other sections of the part may not be desirable, particularly at fillet sections, or at highly stressed thin sections, where high hardness may result in brittle failure of the part in service.

Joseph F. Libsch is Ass't Professor, Dep't of Metallurgical Eng'g, Lehigh U., and Metallurgical Consultant with Lepel High Frequency Laboratories, Inc. Assigned to Springfield Armory during World War II, with rank of Captain, U. S. Army, for research in small arms, he has since been active in metallurgical research.

Co-author R. D. Guess served in the Navy, World War I, and later studied radio theory through Harvard Extension. After several years with Electric Research Products, Inc., he joined the Springfield Armory as Inspector and, now Electrical Engineer, devotes himself to application of high frequency heating.

A large number of small arms components, as well as many small industrial parts, operate under these conditions of service. Unforunately, the normal quench-temper procedure for hardening steels of medium carbon content does not provide maximum hardness and optimum toughness in the same part when it is given a single heat treatment. Therefore, engineers confronted with this problem have generally (1) resorted to carburizing or nitriding; (2) selectively hardened desired sections of the part after previous heat treatment to provide maximum impact resistance; or (3) accepted a compromise in the mechanical properties of the part, frequently with a change to a more expensive, alloy steel.

Carburizing and Selective Hardening

Parts manufactured from steels of low carbon content may be carburized and heat-treated to provide both a tough core, to withstand impact loads, and a hard surface to resist wear. The carburizing treatment is performed at an elevated temperature in a gaseous, salt, or solid carburizing medium. It is difficult to localize the carburized area unless special precautions are taken—such as "stopping off" by copper-plating—to inhibit the diffusion of carbon into areas or sections desired soft.

This procedure requires added processing and equipment. The carburizing process also requires considerable time for effective penetration of the carbon when hardness is necessary for some distance below the surface of the parts treated. Many of these considerations also apply to the nitriding process; in addition, special alloy steels are used for nitriding.

Selective hardening in lead or salt baths, or by flame hardening, is frequently specified to secure maximum hardness at wear surfaces. In many instances, steels of medium carbon content are first hardened and tempered by conventional methods to provide satisfactory impact resistance. The particular section of the part desired to be especially hard is then immersed in, or exposed to, the heating medium to secure the hardening temperature. When this temperature is attained, the part is immediately quenched, thus hardening the heated area selectively.

Where these methods may be used, the hardened section generally is restricted by careful control of the depth of immersion. However, the degree of localization is limited in production because of difficulties in mechanical handling, and conduction of heat, through the part during the "dwell" time in the heating medium necessary to attain the hardening temperature. Accordingly, it has not been easy to obtain a uniform, severely-restricted heat pattern by these methods. Failure to restrict the heat pattern has sometimes resulted in the extension of the hardened section in the part to critical fillets, thin sections, and holes or keyways, resulting in failure of the part during subsequent service.

As a consequence of these conditions, many designers have specified an intermediate hardness of approximately R "C" 45 for quenched and tempered steels of medium carbon content, thereby affording a compromise which maintains some degree of toughness for impact resistance and some degree of hardness for wear resistance; but which sacrifices optimum performance of the part. At hardness levels exceeding R "C" 45, the impact resistance decreases rapidly and notch sensitivity becomes very pronounced.

At hardness levels less than R "C" 45, on the other hand, wear and deformation become excessive on surfaces of sliding contact and on surfaces subjected to high unit pressures. The presence of certain alloying elements provides better toughpess at high hardness levels, and steels containing these alloying elements are generally specified when a compromise in mechanical properties is accepted.

Selective Heating by H-F Currents

Selective heating by high-frequency currents (usually called Induction Heating), followed by quenching, offers considerable promise in achieving hard wear surfaces supported by tough, strong core metal. Parts, fabricated from medium-carbon-content steels, may be first hardened and tempered by induction heating, or by conventional means, to prevent failure from severe impact loads. These parts may then be selectively heated by induction and hardened at the wear surface, thus providing high hardness to prevent, or to minimize, wear and deformation.

The extent of the heating pattern developed for hardening may be severely restricted as the section heated is confined to that section of the part that is within the magnetic field of the load coil. The heating rate is very rapid, providing little time for conduction of heat beyond the desired area and, as the surface of the metal is heated preferentially in the initial heating stages, the depth of heating and therefore of hardening, is subject to close control. In fact, the precise control of heating time, the amount of energy induced in the steel, the speed of heating and the restriction of the heated section account, in large part, for the uniformity of results attained by this method of heating.

The case histories described below illustrate the application of induction heating to selectively harden wear surfaces

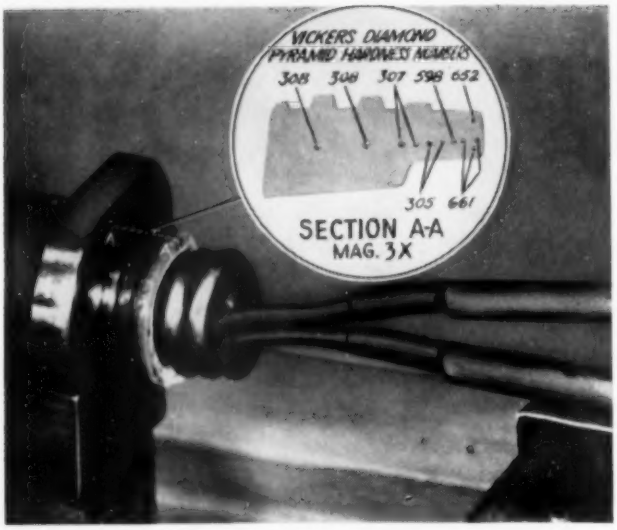


Fig. 1.

of small arms components at Springfield Armory. All parts were heated with a Lepel 15 K.W. converter, operating at a frequency of approximately 300,000 cycles per second. The fixtures and coils shown in the illustrations represent those used during development of the operations described.

Selective Hardening of Wear Surfaces

Fig. 1 illustrates selective hardening to resist wear and deformation at a surface subject to sliding contact under considerable pressure. For this application it is desired to selectively harden the breech rim of the Barrel, U. S. Rifle, Cal. 30, M1, to a hardness of Rockwell "C" 54/56 for a depth of 1/16 inch from the face of the rim, the while maintaining a uniform hardness of R "C" 30 throughout the remainder of the breech. The material used for the barrel is W. D. 4160 steel.

The desired condition is realized by heating rapidly, using a high power input and close coupling between the coil and work. Since heating is restricted to a very small volume of metal, the rate of cooling caused by conduction from the heated metal to the unheated metal is sufficiently rapid to harden the steel, thus eliminating the necessity for an external quench.

The hardness pattern developed in this application is shown in the insert accompanying Fig. 1. The hardness readings shown indicate that the hardness has been successfully limited to the extreme surface of the rim without extending to the corner caused by a change in section.

Fig. 2 illustrates localized hardening designed to resist deformation at a contact surface subject to high unit pressures. The component shown is the Guard, Trigger, U. S. Rifle, Cal. 30, M1. This part is made of W. D. 1060 steel and is hardened and tempered to a uniform hardness of R "C" 42/45 prior to induction hardening. At this hardness level, the ears of the Trigger Guard tend to be deformed in use while, at a higher hardness level, brittle failure occurs during assembly at another point of the component.

To overcome this condition, the Trigger Guard was selectively hardened at the extreme tip of the ears where deformation occurred, restricting the heat pattern to avoid hardening at the base of the ears. The hardness pattern obtained by the treatment is shown in the insert accompanying Fig. 2. It will be noted that the hardened area is limited to the extreme tip of the ear.

Controlled Temperature Gradient

Fig. 3 illustrates selective heating to develop a temperature gradient for simultaneous differential hardening of a welded piston-tube assembly for the Rod, Operating, U. S. Rifle, Cal. 30, M1. The piston is made of stainless steel, type W. D. X51335, and is desired to be as hard as possible to resist wear. To achieve maximum hardness, it is necessary to heat the piston to 1850°F. for hardening. However, the tube—which is flash welded to the piston—is made of W. D. 1050 steel and is subject to grain coarsening when heated to this high temperature, thus providing poor impact resistance in the vicinity of the weld. Before selective treatment by induction heating, the piston-tube assembly was heated to 1590°-1600°F., maintaining a fine grain size in the tube, but sacrificing maximum hardness in the piston.

This compromise treatment is now avoided by induction heating in the coil shown in Fig. 3. By spacing the turns of the coil as shown, a temperature gradient is established, decreasing in temperature from the piston, through the weld, to the tube. This temperature gradiant provides maximum hardness in the piston without coarsening the grain structure of the tube in the vicinity of the weld.

Moreover, the temperature gradient is uniformly maintained, since the load coil and the piston-tube assembly are held in proper location by a fixture. The cross-section hardness of the piston and tube is shown in the insert accompanying Fig. 3. The hardness of R "C" 48/51 on the piston is 10-12 points higher than that achieved by hardening in the furnace at 1590°-1600°F.

Fig. 2.

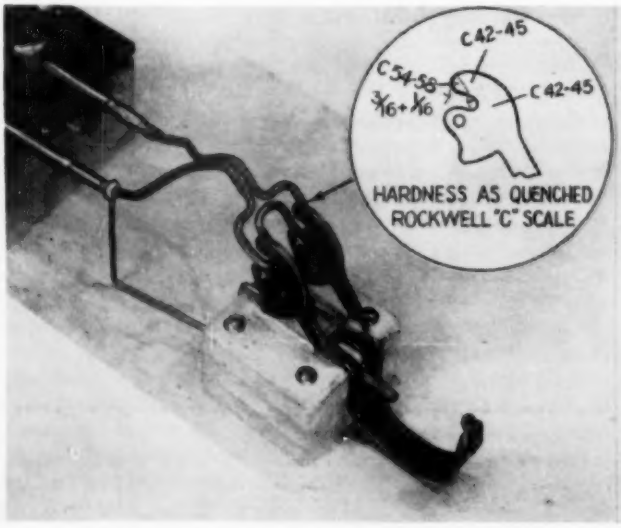
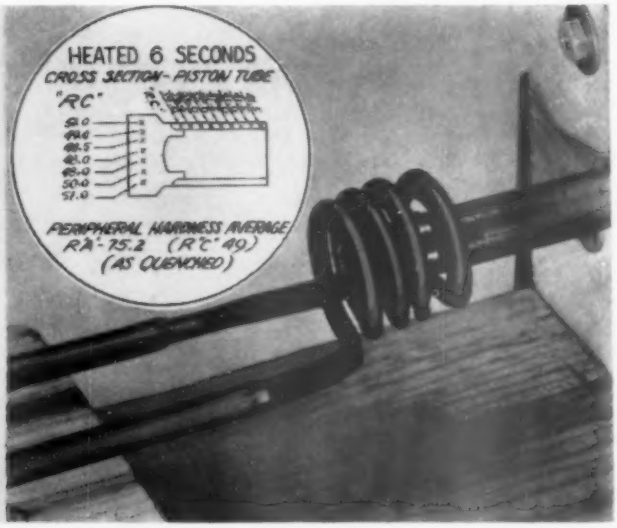


Fig. 3.



By **Watson N. Nordquist**

Efficient Tool Engineering Cuts Motor Costs

Manufacturer Ups Production of Integral Horsepower Induction Motors for Industry

ELECTRICAL MOTORS FOR MASS PRODUCTION are being turned out in large numbers by these same mass production methods, at the Reliance Electric and Engineering Co.'s plants in Cleveland and Ashtabula, Ohio. Reliance, pioneer in providing electric drives for such industries as mechanized mining and sheet milling, has always qualified the "Engineering" part of the firm name.

Generally speaking, motors are tailored to fit—engineered to the specific job. In the past, the many diversified Reliance-built motors precluded over-all mass production methods. Now, however, development of several industries aided by Reliance engineering and Reliance products, and standardization within the industries, has reached the point where standardization of motors and mass production methods are possible. And these motors, while general purpose in every sense of the term, have built into them the extra requirements of a number of specialized industries.

With manufacturing activity at three plants (small motors —Ashtabula; large motors—Ivanhoe Div'n, Cleveland; and controls—Marine Div'n, Cleveland), the engineering for products of all divisions is very closely coordinated. The Engineering, Development and Service Center in Cleveland concentrates within one building all product development and design and all tool engineering functions and facilities.

This new facility represents a practical realization of what Reliance terms an "applied engineering approach" to the problem of producing an integrated group of electrical products. Design engineering, drafting and blueprinting offices occupy the second floor of the Engineering Center. The general experimental laboratory, electronics and control laboratory, tool room, meter room, and renewal parts and service department are located on the ground floor.

Built within the last year, the Ashtabula plant was designed expressly for the low-cost manufacture of a-c. and d-c. motors from 1 to 20 hp. in size. These motors have found countless applications including wide usage as power units for pre-engineered, packaged adjustable speed (V*S) drives built by the company for many of the nation's basic industries.

Much of the production equipment at Ashtabula is special machinery designed and built at the Cleveland Engineering Center. An example is the radial drilling unit, with eight independently powered drill heads for drilling all of the pole holes in any of the d-c. frames for motors from 1 to 20 hp. in size. Feed for each drill is provided by a separate motor and, with the inclusion of a Reliance adjustable speed (V*S) drive, provides a very flexible arrangement for controlling drill speed and feed over a wide range to suit the frame.

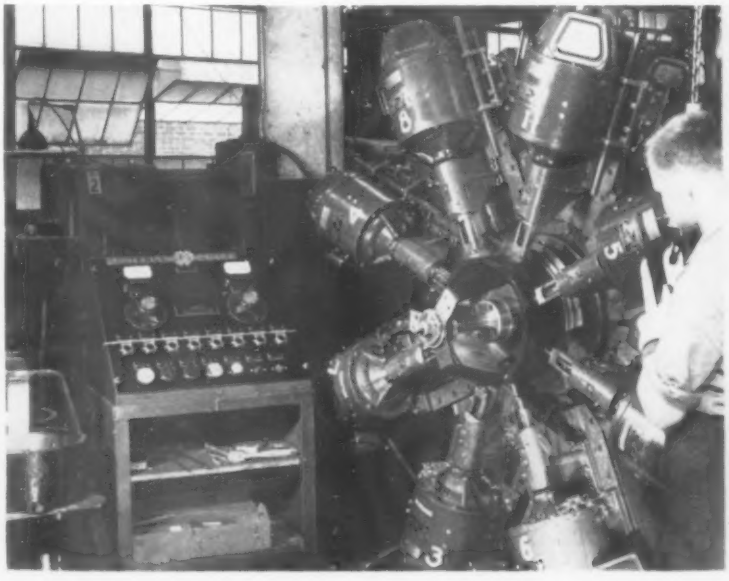
Another ingenious application of good tool engineering practice is a semi-automatic coil winding machine which replaced a hand-operated unit for making hairpin-shaped coils. The operator now merely feeds the wire into position, and the machine forms the coil and cuts it to length.

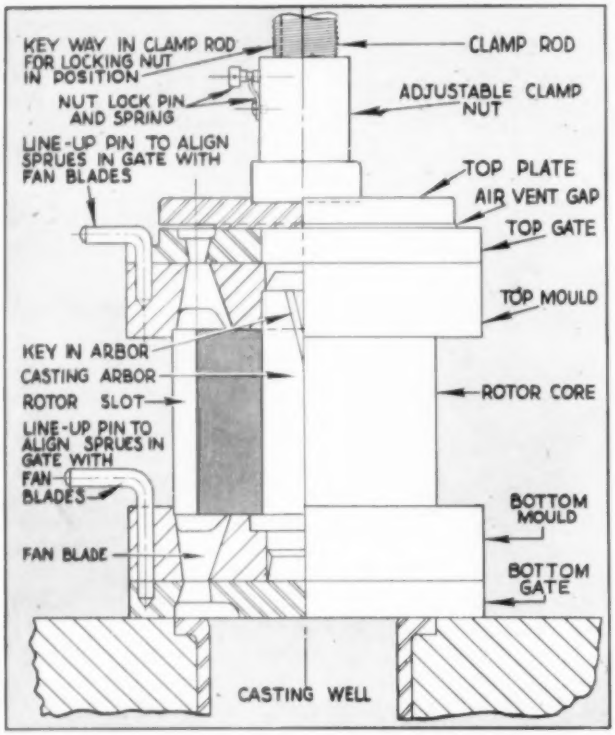
Claimed to be the first American motor manufacturer to successfully pressure-cast aluminum rotors, as large as 30" dia., Reliance is continually developing even more streamlined facilities for producing the large quantities needed of the 1 to 20 hp. a-c. motors.

Rotor laminations are stamped from varnish-coated 26-gauge (electric) silicon sheet steel. These laminations must be notched around the outer periphery to provide channels through which the aluminum can flow to form bars of suitable shape to provide the desired operating characteristics. In order to free all possible equipment for special work, multiple piercing dies have come to replace the rotary notching method of making these laminations.

After the sheet steel is slit to the proper width for various diameter laminations, the strips are fed into a continuous-

Left, below. Radial drilling machine, developed by Reliance, has 8 individually motor-driven heads for V*S controlled simultaneous drilling of all holes required to anchor field poles in d-c. motor frames. Right, below. This die, typical of multi-piercing dies designed by Reliance engineers, produces 36-slot stator laminations shown beside it





Arrangement of mold and rotor core in new casting press.

action Minster 45-inclined adjustable speed press of 100-ton capacity. The blank is stripped free of the die and falls through a chute. Another Minster press, equipped with the multi-slot die, completes the lamination, simultaneously slotting the outer periphery and punching out the center hole. A nest locates the blank in the die.

The same method is employed to produce stator laminations, but, where the rotor blank is of disc form, the stator blank is in the shape of a doughnut, and is then slotted and notched on the outside diameter.

The die member is of segmental construction with a shrink ring and a plug for holding the die segments together. Segments are accurately ground both as to angle and slot profile. The punch members are secured in place by a low-temp alloy (lead bismuth) having a negative coefficient of expansion which firmly locks the punches in place, in a novel retainer. Punch and retainer assembly is so constructed as to compensate for wear with the removal of "shim" plates.

Accurate alignment of dies without the need of accurately indexed machine tools or costly equipment is achieved by the Reliance-developed method of coating punches with a special synthetic resin equivalent to the punch-die clearance.

Dies are mounted in special Reliance-designed and built die sets of Meehanite, with four bronze, oil-lubricated guide pins and bushings. Floating type positive knock-out strippers are actuated by a cam built into the V*S-equipped Minster press. Delayed stripper action operates at top stroke of the press, permitting each punching to fall clear.

Dies are of high carbon, high chrome tool steel, hardened to a Rockwell C63 to C64. Designed to produce 5 million punchings for a maximum grind of 1" of die length, one die has already turned out some 11 million punchings and is still at it.

The rotor laminations are stacked on arbors to form rotors of specified length. Held in proper alignment by an internal keyway, the assembled rotor is placed on top of a mold, locked into position under pressure, and swung into a hydraulically-operated press containing a reservoir that holds a measured quantity of molten aluminum.

With the rotor enclosed by an air-operated safety hood and clamped securely over the pressure chamber, the molten metal is forced upward through the mold and rotor under hydraulic pressures ranging up to 60 tons. While the operation is only of a few seconds' duration, pressure is retained and a blower expels fumes from the press interior and chills the metal.

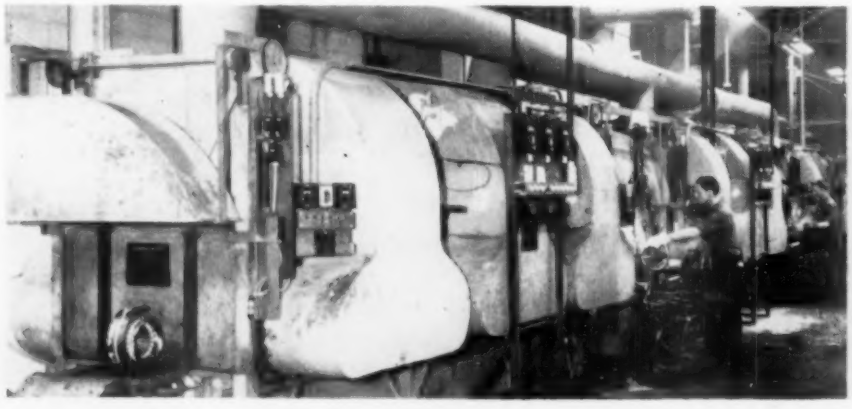
Previously a hot and heavy manual operation, stripping of the casting from the mold is accomplished automatically by a power-operated machine.

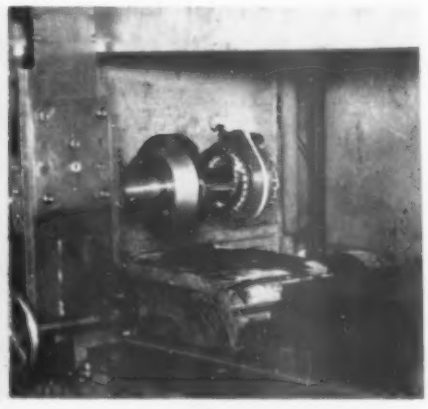
Aluminum is used for several reasons, including the fact that the metal necessary to carry the electrical load weighs one-third less than would the corresponding required copper. Pressure-cast aluminum rotors, offering a rigid, one-piece assembly of core and windings, exhibit no vibration or fatigue failures from the motor being abruptly stopped or reversed. The metal is melted, preparatory to casting, in a 60 KW twin-coil stationary induction furnace, lined with a special composition to avoid contamination of the aluminum which would adversely affect castability or electrical characteristics.

While these are but a few examples of good engineering, the Reliance plants offer many others, including a continuous, semi-automatic process which simplifies and speeds the varnish insulation of stators and armatures. In cooperation with the Blaw-Knox Co., this equipment—the first of its kind—enables 22 units to be processed in 1½ hours as compared with the 12 hours formerly required. This "Zanderoll" process provides automatic timing control of the preheating, dipping and baking sequence within predetermined limits.

These advanced engineering methods are in line with the engineering of all Reliance products and enable low-cost components to be used in the Reliance-built V*S packaged drives for spot conversion to adj.-speed from a-c. circuits.

The Zanderoll process of insulating stators and armatures assures thorough impregnation of fibrous insulating materials and uniform coverage of coil heads and metal surfaces with a protective coating of properly baked insulating varnish. Left, below. Continuous semi-automatic oven which combines dipping and baking. Right, below. A stator being moved from the first oven (preheat) into the first dip tank.





By **A. E. Rylander**

The Tool Engineer's Industrial Exposition in Review

A Supplement to the Preview Which Appeared in March Number, The Tool Engineer

EXCEEDING even the most optimistic predictions, the Tool Engineer's Industrial Exposition, held in the Public Auditorium, Cleveland, Ohio, March 15 through 19, was a huge success from start to finish. Considerably more space had been devoted to exhibits, as compared to the previous ASTE Show held two years ago, and—as far as this reporter could ascertain—practically all the exhibitors reported "good business." At any rate, there was no lack of enthusiasm, either on the part of the exhibitors' personnel or the throngs that vied for close-up scrutiny of the latest in tools for mass production.

As usual, at industrial expositions, the "action shots" attracted more attention than the "stills", although that doesn't mean that the latter suffered from any lack of interest. On the contrary! For example, the gentle flow of a coolant—as by Cimcool Div'n of Cincinnati Milling and Grinding Machines—invited pauses for quiet reflection, yet made its impress on the spectator.

And while tool steels and grinding wheels by themselves may not be sensational, new developments portend sensational results in the scheme of modern metal processing. These things were duly considered by serious minded production executives alert to the cost-cutting possibilities of the Tools of Today. Yet another "still"—the exhibit by Anderson & Sons, Inc.—provided a literal Who's Who in Industry with a display of name plates, panels and escutcheons. Among the unusual exhibits in an exposition of this nature, was a display of scrap by the James Flett Organization, Inc.; thus, with both metals and engineering represented, one could visually run the gamut from design through manufacture to scrap, the latter in turn to be converted to useable raw material.

A "Buyer's Guide"

At this point, it may be stated that this Review is intended to serve a severalfold purpose:—as a reminder to the thousands who attended the Exposition; as deserved mention for exhibitors who did so much to make it a success, and as a source of information to the thousands of our readers and tool engineers in general who could not attend. To that end, the various exhibits will be loosely grouped according to classification; thus, the reader may file this Review as a reference for "from Whom to Buy."

One outfit that had a unique sales appeal was the United States Navy, there to sell national security to all who came to see, look and listen. The machinery now at the command of our armed forces can only inspire utter confidence in the integrity of our country.

Starting with inert materials that, in themselves, were the products of involved processes, the visitor had opportunity to obtain up-to-date information on steels and metals for about every conceivable tool application. Thus, Allegheny Ludlum Steel Corporation had on display tool, high speed, die and stainless steels, as well as carbides. Latrobe Electric Steel Company exhibited a line of high speed, tool and die steels; Columbia Steel Company tool steel only, while A. Milne & Company exhibited hollow (tubular) die steel in a range from 2" O.D. x 1" I.D to 16" O.D. x 12" I.D., also LaSalle "Stressproof" and Timken graphitic tool steels.

Castings—sand and centrifugal—were exhibited by Ampco Metal, Inc., who also displayed solid and hollow bar extrusions, Ampco drawing dies and guide pin bushings among a miscellany of finished and semi-finished parts; Austenal Laboratories, Inc., who exhibited Microcastings in high temperature alloys; Janney Cylinder Company, whose exhibit of centrifugal castings was rounded out with retainer rings for ball bearings in addition to heavy duty bearings; and Haynes Stellite Company, who included precision castings among a wide assortment of cutting tools, wear strips and hard facing metals. All of these exhibits were well attended.

Presses and Press Tools

In tools for metal processing, one had the pick from punch presses to precision jig borers and hole and surface finishing machines. Attracting considerable attention was the Wales Sheet Metal Fabricator, by Wales-Strippit Corp'n, which, with its many accessory hole punching and nibbling attachments, lends itself to a wide range of operations in sheet metal fabrication.

Sharing the limelight, in this field, was the line of small press brakes and benders, by O'Neil-Irwin Mfg. Company, the Hand-Nib line of sheet metal tools by the National Machine Tool Company, who also handled the Hartmann "Gripmaster" vises, a nibbler by Andrew C. Campbell Div'n of American Chain & Cable Co., Inc., who also exhibited automatic cut-off machines. Knight Machinery Company also exhibited press brakes along with power and screw presses, a unique hand tryout press and industrial pumps.

A versatile tryout press, by Alpha Tool Works, was practically a die press room in itself inasmuch as it provided both for die tryout under ideal conditions and for small lot production runs. Denison Engineering Company's exhibit was also a center of interest, the line including hydraulic presses, accessories, hydraulic pumps to 6000 psi and fluid motors to 60 HP capacity. Evans Reamer & Machine Company had hydraulic and electric arbor presses in its exhibit, while Bryant Products Company exhibited a hydraulic press among other appliances.

Punch presses were shown by Cleveland Punch & Shear Works Company, Walsh Press & Die Company, Brandes Press Company, Dake Engine Company, Sales Service Machine Tool Company, Benchmaster Mfg. Company, and Service Machine Company, the most of these concerns showing a line of accessories that included roll feeds. An Air-Hydraulic press was shown by Hy-Air Products Company, and Greenerd Arbor Press Company was out with a new hydraulic press to supplement the standard but improved line of arbor and broaching presses. Haller Machine & Mfg. Co., Inc., had an interesting display of hydraulic stock feeds and press room appliances and, also creating considerable interest, was an automatic force-feed stock oiler, by the Gray-Mills Corp'n.

Dies and accessories were shown by the Cleveland Tool & Die Shops Ass'n, Pivot Punch & Die Corp'n, Allied Products Company, Danly Machine Specialties, Inc., the Die

Supply Company, and the Twentieth Century Mfg. Company. Lempco Products, Inc. and Evans Reamer & Machine Company both had anti-friction guide pin bushings on display as well as die sets, and Steel Products Company exhibited an interesting trimming die. A die flipper and a die set machine (the Lacey) was shown by Moore Special Tool Company. In this class, many modern time saving appliances were shown by the Producto Machine Company, who exhibited hand tapping machines together with die sets and accessories. Die and tool makers supplies were also exhibited by the Sheffield Corp'n. Carbide dies were shown by Carboloy Company, Inc. and Firth Sterling Steel and Carbide Company, the latter having a press in operation on Diecarb blanking dies. All told, one could have set up a complete press room, for medium work, from the equipment displayed, and a complete die shop as well except for heavy kellering machines. And the equipment shown was the latest out in its line.

Metal Cutting Tools

Milling machines were on display by the Nichols-Morris Corp'n, Atlas Press Company, Tree Tool & Die Works; H. B. Rouse & Company, Index Machine Company, and Bridgeport Machines, Inc., the whole providing equipment for both precision tool work and high production. All of this equipment carried the latest improvements. Evoking keen interest was a metal "stitcher", by the Stitching Wire Div'n of Acme Steel Company.

Lathes were exhibited by Sheldon Machine Company, Inc., who also displayed a horizontal miller and a back-geared shaper; Crystal Lake Grinders, whose exhibit (which included a precision grinding machine) aroused the more interest because of turning with a sapphire tool provided by the Sapphire Products Div'n of Elgin Nat'l Watch Company; Atlas Press Company; the Schauer Machine Company (speed and polishing lathes), who also showed lapping and filing machines; and the South Bend Lathe Works, who exhibited a new precision drill press along with improved toolroom and precision lathes and a precision bench shaper. These exhibits aroused more than usual interest.

The visitor also had a very wide choice of grinding machines, both for production, tool room requirements and tool grinding—in fact, it would be hard to say that any of these tools was outstanding over the rest. Each had its purpose, and all had their admirers. A circularity grinding attachment by the Detroit Reamer & Tool Company featured the latest refinements, and this company also had on exhibition standard and special HSS reamers and drills, the latter including the large-channel oil drills which are a D. R. & T specialty.

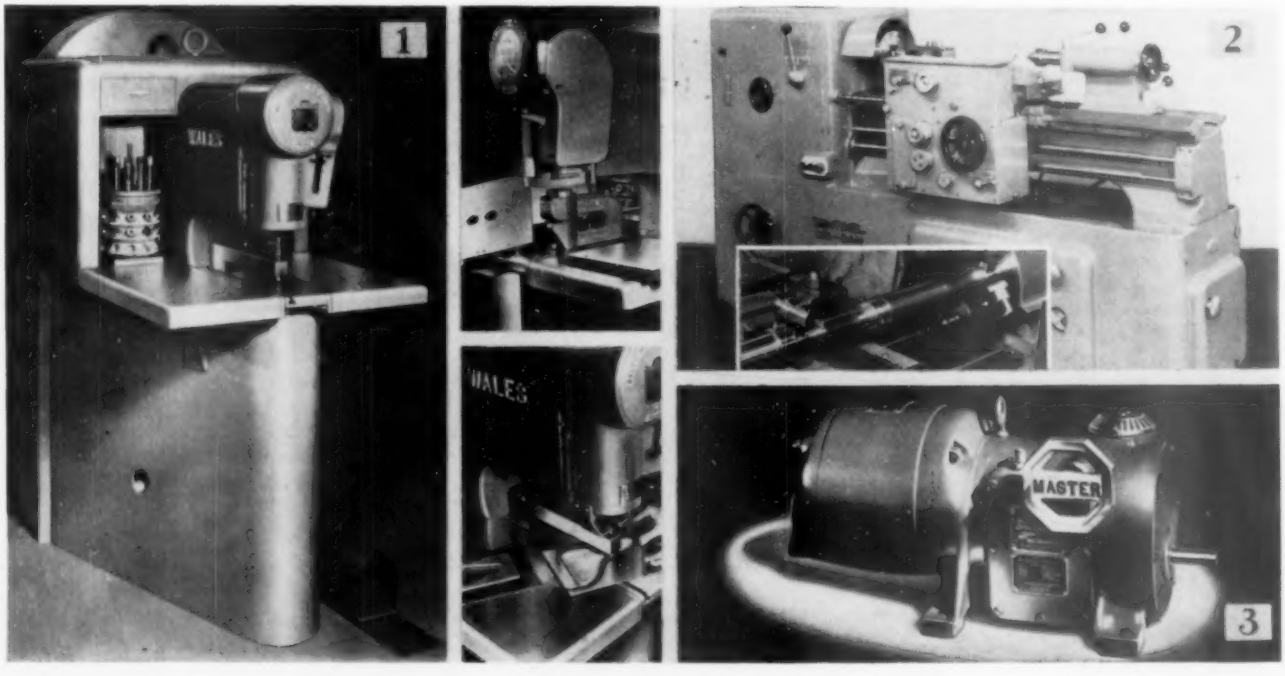
Radial relief grinding fixtures, and a grinder, were shown by the Royal Oak Tool & Machine Company, and a grinding fixture for axial and radial relief tool grinding was displayed by the Govro-Nelson Company, who also exhibited an interesting line of automatic centrifugal feed drilling and tapping units. Delta Mfg. Div'n, Rockwell Mfg. Company, had a line of toolroom, surface, tool and carbide grinders along with bandsaw and cut-off machines, and drill presses. Carbide tool grinders were also on display by DoAll, the Wickman Corporation, the latter also showing a unique bench lapping machine with steel-bonded diamond wheel. A versatile line of automatic flute, circular and band saw grinders was shown by the Wardwell Mfg. Co., who also exhibited automatic saw filing and setting equipment.

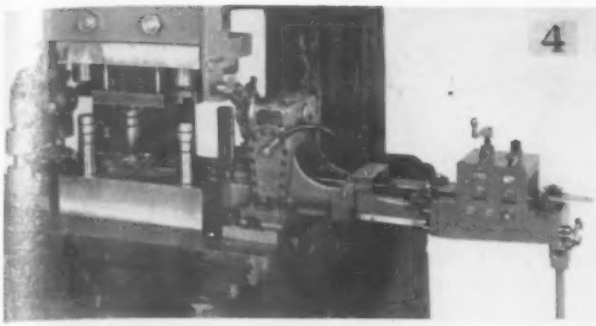
Among the midgets, and a honing device rather than a grinding attachment *per se*, was the "True Point" drill sharpener, by Up-To-Date Tool Company, a gadget especially designed for sharpening very fine drills. Profile and surface grinders, as well as copper head laps, augmented the Boyar-Schultz broad line of screw machine tools.

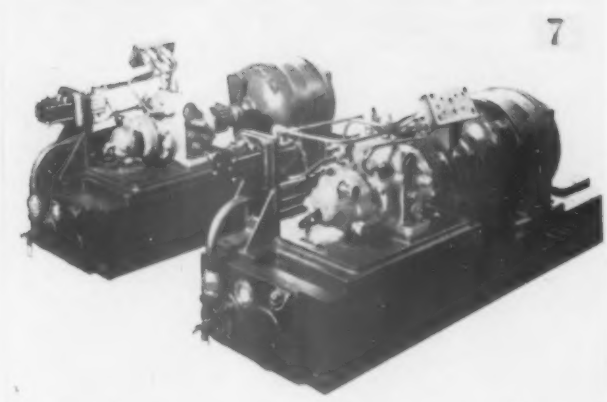
Tool post grinders were shown by the Dumore Company; a drill grinder and cutter sharpener by Edward Blake Company; cutter grinders by Giddings & Lewis Machine Tool Company; and a tap grinder by Henry P. Boggis & Company. Portable grinders were shown by Buckeye Tools Corporation along with a line of portable pneumatic and high frequency electric tools. Saw sharpening tools were exhibited by the Simonds Saw & Steel Company.

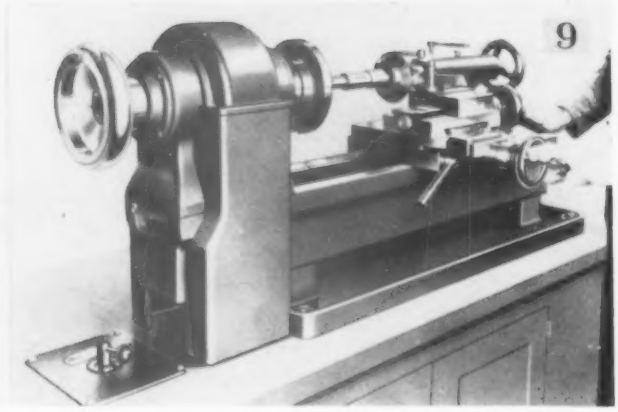
Production grinding, polishing and buffing machines were shown by the R. G. Haskins Company, who also exhibited bottle capping and screw driving equipment; by Hammond Machinery Builders, Inc., who included carbide and diamond finishing tool grinders among abrasive belt grinding-

(1) The Wales Sheet Metal Fabricator, by Wales-Strippit Corporation, No. Tonawanda, N. Y. Insets show examples of outside and inside nibbling, and the Type "BL" Hole Punching unit. (2) The Sentinel Cri-Dan, Semi-Automatic High Speed Threading Machine, by the Lees-Bradner Company, Cleveland, Ohio. Inset shows close-up of operation. (3) The Master Speedranger, an all-metal unit offering infinitely variable speed range, by the Master Electric Company, Dayton, Ohio.









(4) The Haller Hydraulic Stock feed, for punch presses, a product of Haller Machine & Mfg. Co., Detroit. (5) The SPE-D-CUT Reamers, by Wendt-Sonis Company, Hannibal, Mo.; also a Criterion Boring Tool, manufactured by the Criterion Machine Works, Beverly Hills, Calif., but distributed nationally by Wendt-Sonis. (6) The T-S56 toolroom Precision Lathe, one of several precision lathes shown by the Sheldon Machine Company, Inc., Chicago. (7) Hydraulic systems used in connection with the new Precision Boring Machine, by the Simplex Machine Tools Div'n of Stokerunit Corp'n, Milwaukee. Completely self-contained, the hydraulic systems are assembled into easily serviced units with all piping carried to one centralized manifold. (8) A "big brother"—the largest of its type ever fabricated—of the ultra-precision Granite Surface Plate, by the Herman Stone Company, Dayton, Ohio. Shown also is the new granite Straight Edge, a "new" among precision tools. (9) A precision Bench Lathe, by C. L. Lathes, Div'n of Crystal Lake Grinders, Crystal Lake, Ill. Also shown by the company was a precision Bench Grinder of advanced design. Both machines were in operation.

polishing machines and backstands; and by the Porter-Cable Machine Company, whose line included portable hand sanders and radial saw among a wide assortment of abrasive belt and contour belt grinders. Precision grinding spindles, to be used as units in standard or special precision grinding equipment, were exhibited by the Ex-Cell-O Corporation, Continental Tool Works Div'n. Precision honing equipment was shown by the Sunnen Products Company, and centerless lapping machines by Size Control Company, Div'n of American Gage & Machine Company.

Presenting a "new" in the field of finishing was Vapor Blast Manufacturing Company, whose exhibit of an entirely new liquid honing cabinet, shown for the first time, attracted considerable attention. Displays of liquid honed tools, by this company, included broaches, hobs, dies and molds. Also new was the Vulcanaire jig grinding attachment, by the Vulcan Tool Company, who also exhibited a transfer machine and special tools. A precision jig grinding machine was shown by the Moore Special Tool Company, who also had a panto-crush wheel dresser. Wheel crushing equipment was also shown by the Sheffield Corporation and the Jerpbak-Bayliss Company.

The DoAll Company's exhibit, which included the Arlin Special Segregator (electronic sorting) among a wide assortment of precision production and toolroom equipment, and gage blocks, attracted more than usual interest because of a "phantom" band sawing machine in which the entire works were clearly visible through the Plexiglas housing. While the latter didn't exactly "steal the show" from the rest of the DoAll exhibits, it was nevertheless a magnet to draw the crowds. Among other interesting exhibits was that of profile turning, by the Turchan Follower Machine Company, who demonstrated intricate contouring on a 16" lathe equipped with a Turchan Duplicator.

Purely pictorial displays had their attraction as well as tools *per se*, as evidenced by the stream of visitors to the Snyder Tool & Engineering Company booth, where lively interest was shown in the Snyder "in-line" equipment as well as in the general line of special machines produced by the company. Like many others, Snyder reports "good business." Photos of jigs, fixtures and special machines were included with samples from metal stamping dies by the Star Machine and Tool Company.

This interest in "pictures" was further evidenced in the display by Design Service Company, whose engineering exhibit featured symbolic display material of a broad-range engineering service; and in the exhibit by Engineering Service, Inc., who was prepared to "sell" a complete engineering service from design of tools to complete plant layouts. Also shown by this company was the Visi-trol system for visible control of materials.

In this connection, engineering offices could be completely equipped, from the most elementary drafting tools to slide rules through to blueprinting and duplicating equipment by such internationally known concerns as Eugene Dietzgen Company, Keuffel & Esser Company, the Frederick Post Company, Charles Bruning Company, Inc., Engineering Mfg. Company, Hamilton Mfg. Company, and Reproduction Products Company. Emmert Mfg. Co. exhibited horizontal and vertical drafting machines and a novel universal vise. Reproduction equipment and supplies were shown by Ozalid Div'n of General Aniline & Film Corp'n.

Work Holding Tools

Since machine tools must have work holding equipment, it may logically be assumed that the latest in this line was included in the Exposition. Rockford Magnetic Products Co., Inc., demonstrated climb milling of keyways by the simple expedient of literally throwing a shaft, against a stop, in a V-grooved magnetic chuck. No other hold-down. Rockford also exhibited a magnet separator for steel and non-ferrous metals. Magnetic chucks, for toolroom and production requirements, were also shown by Taft-Peirce Mfg. Company and the Brown & Sharpe Mfg. Company.

In view of the high operating speeds of modern turning machines, there is now a definite trend toward chucks with lightweight aluminum alloy bodies, as shown by the Whiton Machine Company; Whiton also exhibited a novel power chuck wrench and a high production automatic gear cutting machine in an extensive line. The Skinner Chuck Company also exhibited light-body chucks along with aluminum body rotating air cylinders and a wide variety of machine vises. In line also was the Union Manufacturing Company, who supplemented late model power chucks with several types of manually operated chucks and work holders. Cushman Chuck Company exhibited an extensive line of wrench, air and power operated lathe chucks.

Precision collets and work holding fixtures were exhibited by Hardinge Brothers, Inc., whose display also included collet index fixtures, Hardinge-Sjogren speed collet chucks, and circular form tools; by the Erickson Tools Division, with expanding mandrels and collet chucks, full-floating holders, and special tools; and by Sutton Tool Company, who displayed flat and roller lapping machines in addition to a wide line of collets and feed fingers for automatic screw machines. An interesting pneumatic bar stock feed was shown, in operation on a small Warner & Swasey hand screw machine, by the Lipe-Rollway Company. Lipe-Rollway also introduced a new portable power hacksaw—the Hand-I-Hack—which may be operated from any convenient outlet.

A wide line of drill and tap chucks, as well as milling machine arbors, adapters and cutting tools was shown by Scully-Jones & Company, and standard and special tool holders for the various makes of automatic screw machines were exhibited by the Screw Machine Tool Company. N. A. Woodworth Company exhibited a line of precision gear holding chucks and diaphragm chucks for internal and external grinding.

Quick-change holders, together with arbors, boring bars and cutters, and miscellaneous boring and milling machine accessories were shown by Beaver Tool & Engineering Corp'n. Lathe and drill chucks, as well as face plate and boring mill jaws, were displayed by E. Horton & Sons Company. Quick-change drill and tap chucks were also shown by the McCrosky Tool Corporation, while tap chucks, as well as tapping heads and equipment, were shown by the Charles L. Jarvis Company, Ettco Tool Company, and Procunier Safety Chuck Company.

Among the extensive exhibits was that of Cosa Corporation, whose line of Swiss precision machines included a new pantograph engraving machine, a large and a small jig borer, and gear hobbing and grinding equipment. Also showing foreign precision tools was the Hauser Machine Tool Corporation, who exhibited a Swiss jig borer, an optical hardness tester, a profile-measuring microscope, a profile projector, and rotary tables.

Domestic precision equipment, in comparable lines, included a high-precision jig boring machine by Moore Special Tool Company, and optical comparators and projectors by Jones & Lamson Machine Company, Bausch & Lomb Optical Company, and the Eastman Kodak Company. These machines may well be said to be the last word in modern optical inspection tools.

"News" in the grinding field were presented by the Norton Company, who introduced a reinforced resinoid-bonded cut-off wheel, trade marked "Norflex," and who also exhibited the recently introduced 32 Alundum grinding wheels; and by the Carborundum Company, who introduced the "Series 20" toolroom wheel in addition to showing a wide range of mounted wheels and abrasive products.

Grinding wheels and abrasive products for various uses were also displayed by the Bay State Abrasive Products Company, the Allison Company (who also showed an abrasive cut-off machine), the Macklin Company, Simonds Abrasive Company, and the J & S Tool Company, Inc. Diamond abrasives were shown by Arthur A. Crafts Co., Inc., the Engis Equipment Company who, with the Sapphire Products Div'n, showed the Elgin Hyprez diamond compound. Precision emery wheel dressers were shown by the Last Word Sales & Eng'g Company.

From Alpha to Omega

"Good housekeeping" facilities were provided by the G. H. Tennant Company and the Breuer Electric Mfg. Company, the first showing floor cleaning equipment and paints for traffic purposes, and the latter industrial vacuum cleaners in addition to floor cleaning equipment. In this class, too, may be mentioned the Barnes Drill Company, whose coolant separator, which removed sludge and metallic particles from coolants, aroused lively interest. Paint and varnish brushes, and general maintenance brushes, were shown by the Osborn Mfg. Co. Vacuum cleaners and dust collectors were also shown by Ideal Industries, Inc., whose exhibit included live centers and electric etching tools. The office, too, could look to McCaskey Register Company for such essential "tools" as machine, inventory, payroll and cost systems, while the stockroom and inspection departments could look to Cadillac Stamp Company for marking devices that included a hydraulic marking machine.

Because of its wide application to industrial uses, the exhibit of Fiberglas products by Owens-Corning Fiberglas Corporation attracted general interest, the exhibit having been supplemented with an interesting full-color sound film—"Watts in Glass". Also a center of interest was the

exhibit of induction heating, by the Tocco Division of Ohio Crankshaft Company, and the small and medium die sinking machines exhibited by DCMT Sales Corp'n and the Miller & Taylor Tool Company. A controlled atmosphere furnace, for the heat treating of tools, dies and other products, by the Delaware Tool Steel Corp'n, was displayed with a transparent Lucite muffle so that spectators could visualize the operating principle.

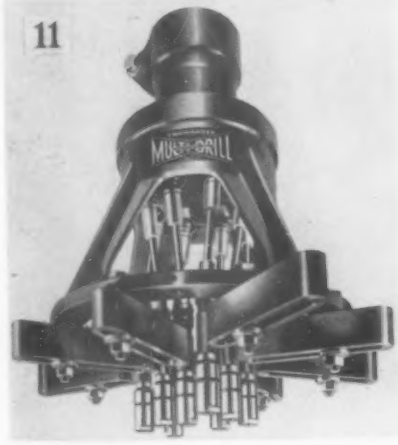
A multiple-purpose machine—the Thomas "Metal Master"—for nine working operations complete in one machine, was shown by the Clinton Machine Company. Other exhibits that had their rings of the interested included the Index Master, by Cleveland Republic Tool Corp'n; Lectro-Count, an electronic counting machine and recorder, by the Lansing Engineering Company; the "Lectroetch" marking equipment, by the Lectroetch Company; and the exhibit of granite surface plates and straight edges by the Herman Stone Company.

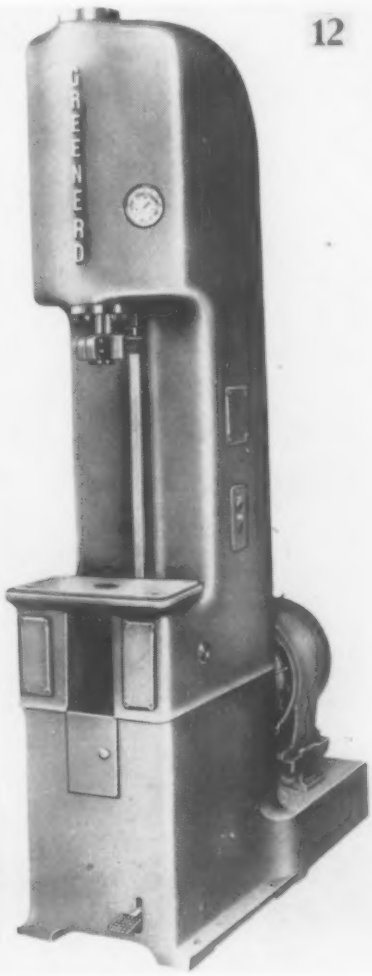
Literally, the list of exhibits ran the alphabetical scale from A to Z, and oddly enough the head and the tail were closely related inasmuch as both had to do with drilling and boring tools. Thus, Accurate Bushing Company displayed standard and special drill bushings; the Adjusto Boring Bar, adjustable boring bars as the company name implies; Ex-Cell-O Corp'n, drill bushings, drills and reamers in a diversified exhibit; Zagar Tools, Inc., multiple gearless drill heads along with a broaching machine and index fixture; and the W. M. Ziegler Tool Company, a line of floating tool holders for taps, reamers, die heads, and counterbores.

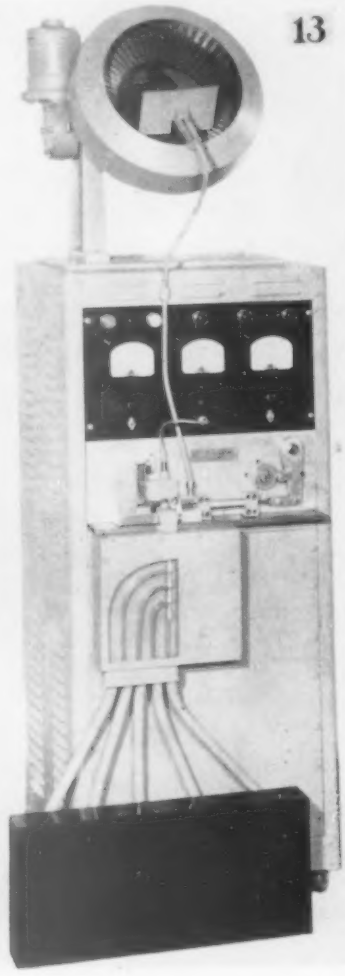
A unique multi-drill head was also exhibited by the Commander Mfg. Company, whose showing included a clutch driven Multi-Torque tapper with capacity from 0 to ¾". Medium heavy upright and radial drills were shown by Canedy Otto Mfg. Company, and sensitive upright and radial drills by Walker Turner Company, Inc. Delta Manufacturing Div'n included sensitive drills in its exhibit, and the Dumore Company a line of midget, high speed highly sensitive bench drills. Cleveland Tapping Machine Company exhibited Models E0 and E4 lead screw tapping machines, and the Thread-All Sales Company automatic and manually operated tapping attachments. Sensitive drilling and tapping machines were also exhibited by the Hamilton Tool Company, while the Locke Gage Company showed automatic power drilling and tapping units along with a line of thread and plug gages, and an indexing fixture.

Visitors had a wide choice of transmission equipment, ranging from *Tilton* woven endless fabric transmission belts, by Arthur S. Brown Mfg. Company, through electric motors by Delco Products Div'n, G. M. C., to variable speed drives by DoAll, Reeves Pulley Company, Ohio Gear Company, and Master Electric Company. Joseph Richter & Company displayed American Standard roller chain sprockets and connecting links with various types of lugs. Bearings and pillow blocks—plain, anti-friction and self aligning as well as spherical—were exhibited by the Heim Company. A complete line of Oilite bushings and bearings was exhibited by Amplex Div'n of Chrysler Corporation.

(10) Dual-roll Centerless Lapping Machine, by Size Control Div'n of American Gage & Machine Company, Chicago, who also exhibited a granite Surface Plate, reversible Plug and Thread Gages and the Walsh Punch Presses. (11) The Commander Mfg. Company, Chicago. (12) One of several of the new "G" line of Hydraulic Presses, by the Greenerd Arbor Press Company, Nashua, N. H. (13) The Arlin Special Segregator, by Arlin Products, Inc., Detroit, and exhibited by the DoAll Company, Des Plaines, Ill.







Portable tools—electric and pneumatic—were to be had for about every possible industrial use. A small pneumatic drill, by the Ingersoll Rand Company, had unusual power while yet comparing in size with an ordinary flashlight case. Powerful "midget" air tools were also shown by Aro Equipment Company—in fact, all of the portable air and electric tools shown were unusually rugged and powerful as might be expected from these latest developments in the field of portable tools.

Portable drills, grinders, sanders, impact wrenches, nut runners and so on and on were to be had from the aforementioned as well as Buckeye Tools Corporation (who included a portable nibbler), Chicago Pneumatic Tool Company, Rotor Tool Company, Superior Mfg. Company (Bantam air hammers), and Illinois Gage & Mfg. Company, the latter showing a unique torqueless nut setter with unusual features. Sockets for impact wrenches, and adaptors for similar industrial tools, were on display by the Snap-On Tools Corporation. A complete display of flexible shaft equipment, with accessory tools, was shown by Kellerflex Pratt & Whitney, Div'n Niles-Bement-Pond Company. Lighter flexible shaft tools were also included in the exhibits by Chas. L. Jarvis Company and Dumore Company. A novel variable torque automatic wrench, with planetary drive and a magnetic brake, by the Fen Machine Company, evoked more than usual interest.

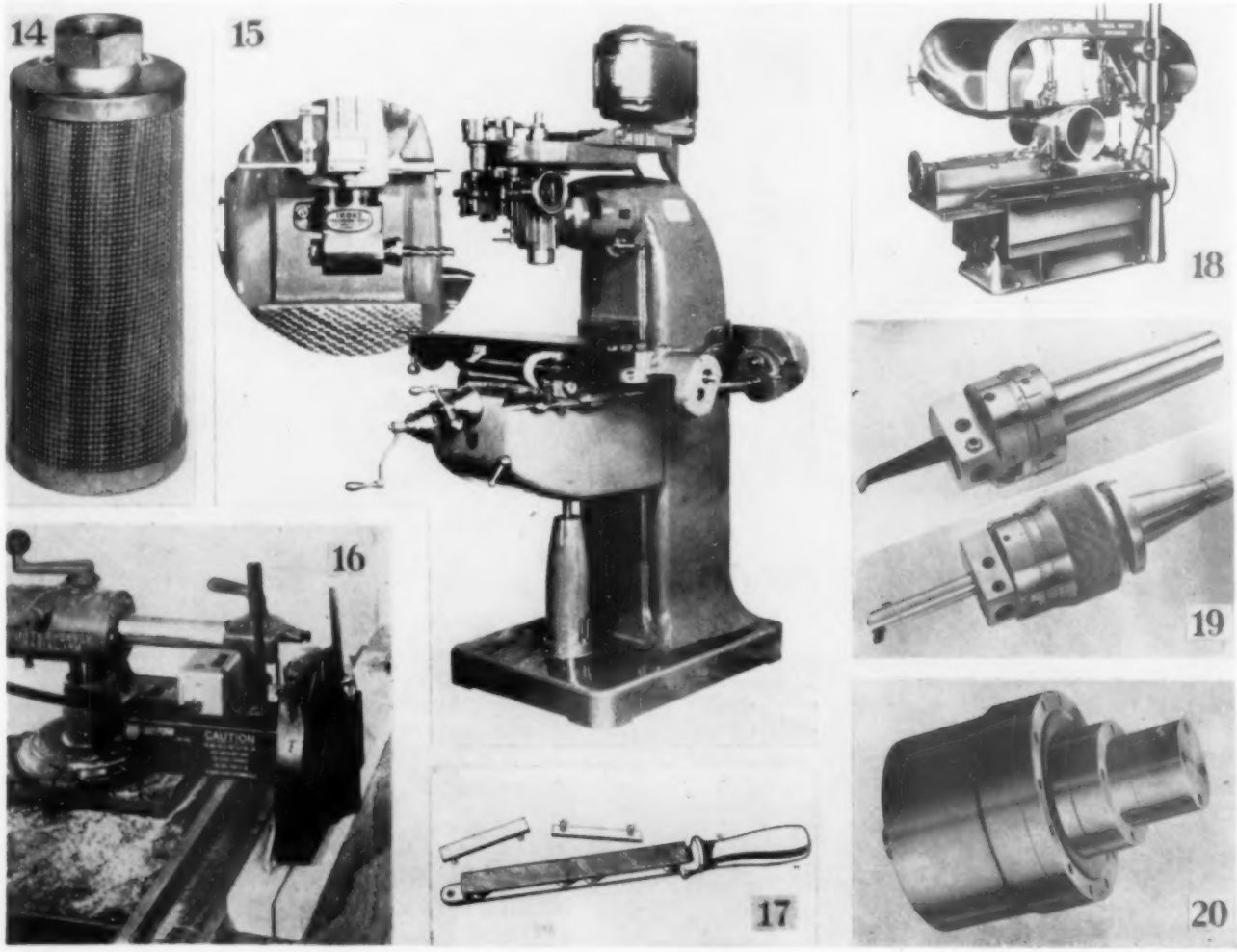
Attesting to general interest, however, is the fact that in several instances, heavy machine equipment had been sold from the floor before the Exposition was well under way. The consensus of opinion was that the Show was too interesting, as a whole, and too diversified, to be seen in the short time at the disposal of many who attended.

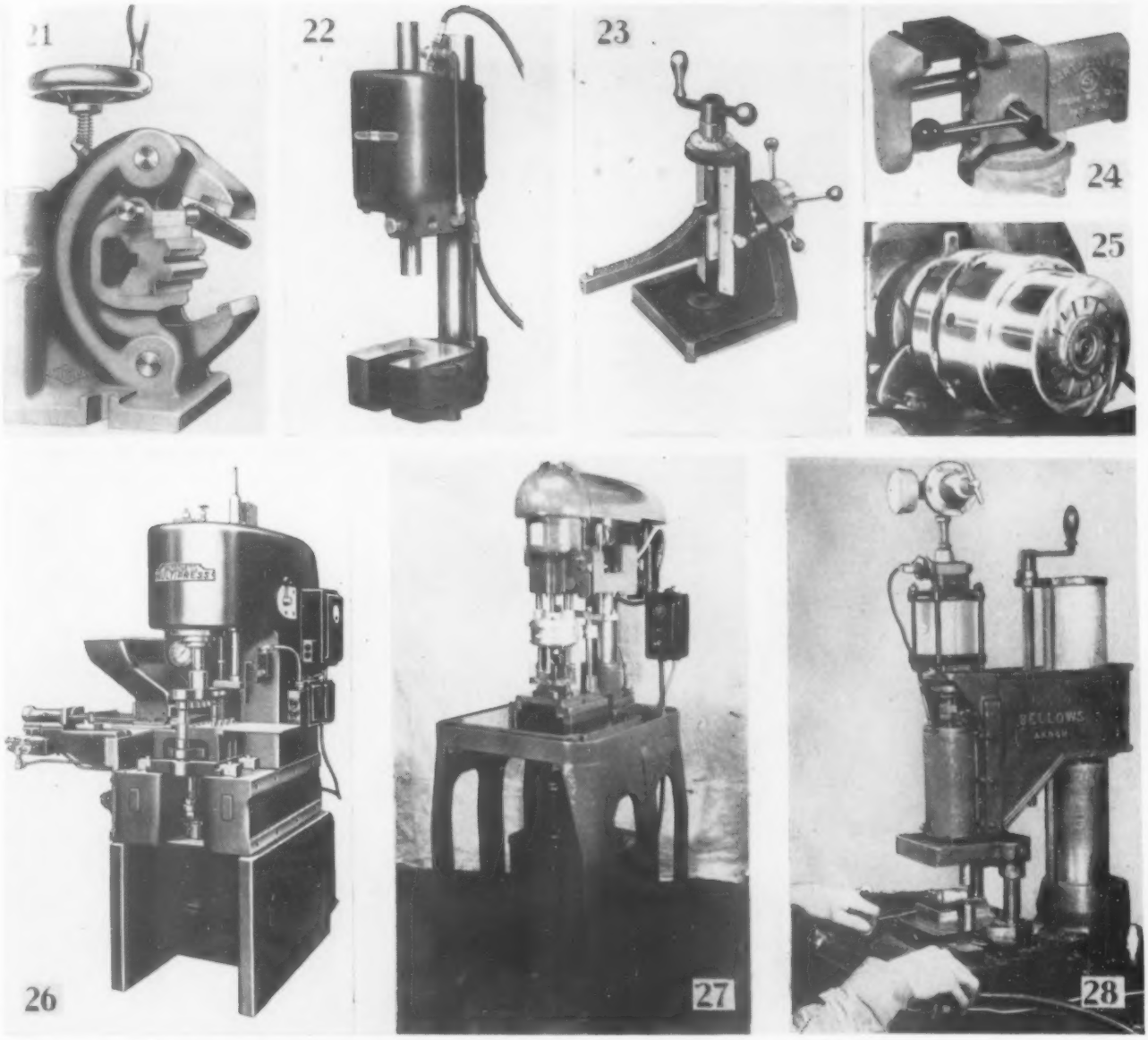
In the case of cutting tools, there is so much overlapping of milling cutters, drills, reamers, boring tools and turning tools that these cannot be readily segregated into classes. Sufficient to say that the tool engineer in quest of cutting tools could have found a cutter for any job with which he may be faced. And they were all good!—the best that modern tool engineering can produce.

While the majority of makers of cutting tools included carbide and cast alloy tipped tools in their exhibits, specialized applications were shown by Carboloy Company, Inc., Willey's Carbide Company, Firth Sterling Steel & Carbide Corp'n, Wendt-Sonis Company, Kennametal, Inc., and Haynes Stellite Company. In addition to displays of cutting tools alone, the exhibits of these companies included many novel applications and mounts of carbide bits and insets.

Gairing Tool Company's new E-Con-O-Mill, recently introduced in our Tools of Today pages, made its first public showing at the Exposition. In addition to displaying its broad line of solid and tipped carbide tools, the Super Tool

(14) The new model Synclinal Oil Filter, by Marvel Engineering Company, Chicago. (15) The new Model 50 High Speed Vertical Milling Machine, by Index Machine Company, Jackson, Mich. A newly developed Right Angle Milling Head, quickly attached to the machine, is shown in the inset. (16) A new High Speed Radial Saw, by Porter-Cable Machine Company, Syracuse, N. Y. (17) Ground Carbide Hand Files, furnished either as complete files or as carbide segments, by Severance Tool Industries, Inc., Saginaw, Mich. (18) The new Wells No. 12 heavy duty Metal Cutting Band Saw, by Well Mfg. Corporation, Three Rivers, Mich. The machine has automatic cutting cycle, electrically controlled pressure and a self-contained wet cutting system. (19) These new Boring and Power Facing Tools, by Maxwell Company, Bedford, Ohio, made their initial bow to industry at the ASTE Show. (20) "Unveiled" by the Cushman Chuck Company, Hartford, Ct., was an entirely new series of high speed Air Cylinders for use with Cushman chucking equipment.





(21) A new Self Centering Vise, for holding shafts or spindles from 3/8" to 3 1/8" in diameter, was one of several interesting displays by the Producto Machine Company, Bridgeport, Ct. (22) Latest contribution to the Bryant line of air and hydraulic equipment is the "Exploded Air" principle applied to a bench-type Production Hammer which gives impacts from one ounce to 12,000 lbs. with 100 lbs. line pressure. (23) A new, direct reading grinding wheel Radius Dresser, by Perfex Gage and Tool Company, Mt. Clemens, Mich., was among interesting displays at the Show. (24) The Hartman "Grip-Master" Vise, exhibited by the National Machine Tool Company of Racine, Wis. (25) The No. 901 Pull Chuck, one of many precision work holding devices shown by Erickson Tools Division, Cleveland, Ohio. (26) The new 8-ton automatic Multi-press, exhibited by the Denison Engineering Company, Columbus, Ohio. (27) The Model No. 73.00 Eltco-Emrick air and electric Tapping and Drilling Machine, by the Eltco Tool Company, Brooklyn, N. Y. (28) The Bellows Impact Press, by the Bellows Company, Akron, Ohio, an air operation modern-heavy press for assembling, forming, riveting and similar operations.

Company demonstrated its recently developed "Ejector" type tools. The Gorham Tool Company's line of standard and special tools was highlighted by a large diesel engine crankshaft, the main bearings and crank pins of which had been machined with a new Gorham crankshaft turning tool.

Among the larger displays, in this class, was the exhibit of counterbores and similar tools by the Eclipse Counterbore Company. Unique was a new taper shank, quick detachable cutter, shown by Eclipse for the first time. Ex-Cell-O Corp'n also exhibited a quick detachable cutter in an extensive line of cutting tools. A diversified line of midget mills, inside and outside deburring tools, chatterless reamers and carbide die-machine files was shown by Severance Tool Industries. Unusually complete was the kit of boring and facing tools, by the Davis Boring Tool Div'n of Giddings & Lewis.

Boring and facing tool heads were shown by The Maxwell Company, Chandler Tool Company, C. C. Craley Mfg. Company, Everede Tool Company, and OK Tool Company, and boring bars and boring tools by Melin Tool Company, McCrosky Tool Corp'n, and Microbore Company, among other cutting tools. Boring and bottoming tools were also included in the Bokum Tool Company and Wetmore Reamer Company exhibits. Boring bars, among a miscellaneous line of inserted and solid blade single point turning tools, and milling cutters, was also included in the Viking Tool Company's display. Weddell Tools, Inc. exhibited boring heads and flywheel arbors along with the latest in the "Tri-Bit" line of cutting tools.

"Rigidcut" inserted blade face mills, and "Varicut" plain side and staggered tooth milling cutters were shown by the Wesson Company, together with Wessonmetal tools and flat and round universal vises. Reltool Corporation exhibited "Shockless" and standard plain and bell type center drills along with cutters and machine tool accessories, and Nelco Tool Co., Inc., a line of carbide tipped milling cutters, woodruff keyseat cutters, slitting saws, and single point tool bits.

Circular form tools were shown by Hardinge Brothers and Circular Tool Company, the latter also showing a line of metal slitting and screw slotting saws. Martindale Electric Company also exhibited circular saws and cutters together with electrical testing instruments and a unique pipe intersection compass. Carbide tipped end mills, reamers and spot-facers, and special tools, were shown by Staples Tool Company, and circular tools and saws by Motch & Merryweather Machinery Company.

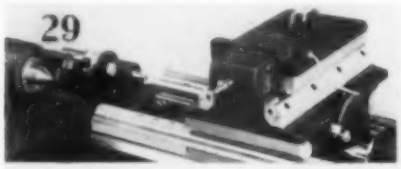
In addition to several of the foregoing, who included drills and reamers in their displays, the Gammons-Hoaglund Company exhibited helical taper pin, die makers' and chucking reamers, and allied cutting tools. Morse Twist Drill & Machine Company exhibited twist drills, reamers, spiral fluted taps and sleeves and sockets among a miscellany of kindred tools. Black Drill Company's "Hardsteel" drills were demonstrated in actual drilling of file hard materials.

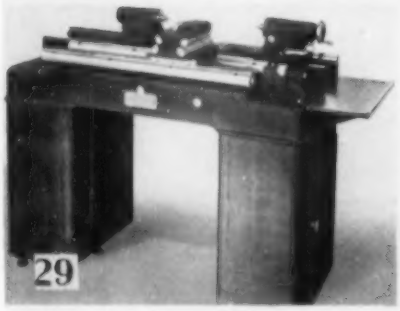
The technical press was there, too, the Exposition being "Big News" in the trade publications field. In addition to The Tool Engineer, The Iron Age, Machinery, Tool & Die Journal, and McGraw-Hill Publishing Company had exhibits at the Show. So did Conover Mast Publications, Hitchcock Publishing Company, Gardner Publications, The Technical Publishing Company, Screw Machine Publishing Company, Metal Working Equipment, and Penton Publishing Company. Between them, they just about "covered the waterfront" as far as the diversity of exhibits is concerned.

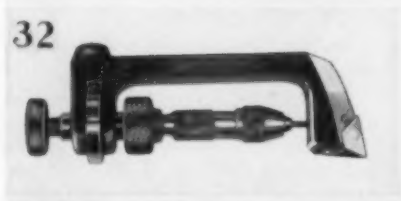
Broaches and broaching tools were shown by Detroit Broach Company, Ex-Cell-O Corp'n, and National Broach & Machine Co., the latter also showing gear shaving cutters and gear testing equipment. National Tool Company exhibited surface broaches along with master gears and a miscellany of cutting tools, and East Shore Machine Prod. Company adjustable expanding keyway push broaches.

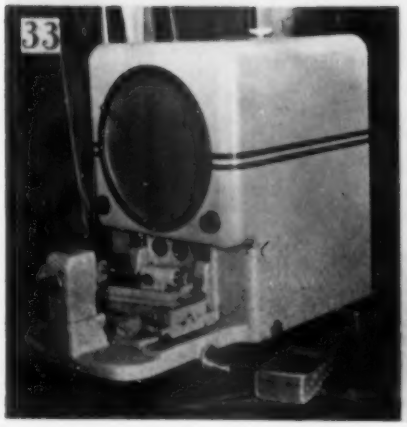
The trend toward standardized jig and fixture components, initiated over 25 years ago, was accentuated by broad displays of these parts. Jig components were shown by Jergens Tool Specialty Co.; Morton Machine Works; Noble & Stanton, Inc.; and Northwestern Tool & Eng'g Company. Complete fixtures, as well as components, were shown by Swartz Tool Products Company and Q-C Engineering Products, the latter also showing a new index table, and by

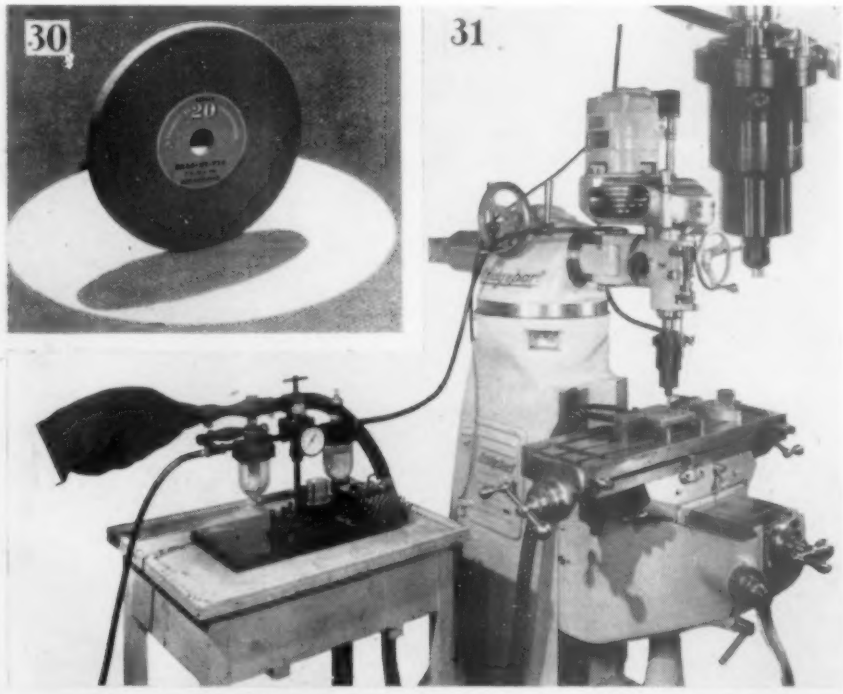
(29) Model "C" Electro-Mechanical Lead Tester, one of many gaging appliances exhibited by Pratt & Whitney Division, W. Hartford, Ct. (30) Typical "Series 20" Grinding Wheel, a new development designed for toolroom use and production jobs by the Carborundum Company, Niagara Falls, N. Y. (31) The Vulcanaire Jig Grinding Attachment, by Vulcan Tool Company, Dayton, Ohio. Shwon mounted on a Bridgeport Milling Machine. The attachment is shown enlarged in inset. (32) The "True Point" Drill Sharpener, for fine drills, by Uo-To-Date Tool Company, Worcester, Mass. (33) Contour Projector, for gear checking, by the Eastman Kodak Company, Rochester, N. Y. (34) A new self-truing, motorized Crushing Device, by the Sheffield Corpo ation, Dayton, Ohio, for forming cast iron "crushtrue" tools and "crushtruing" grinding wheels. (35) The new "Norflex" Reinforced Resinoid Cut-off Wheel, by Norton Company, Worcester, Mass., designed to provide an unusually high safety factor and fast cutting action.

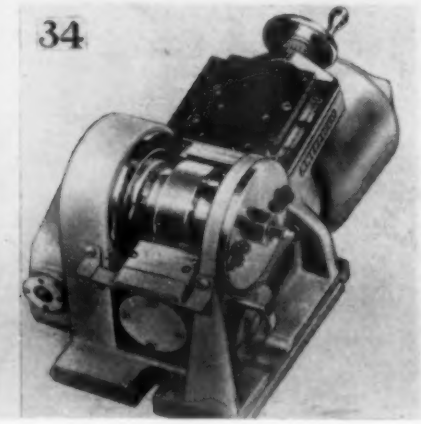












Manufacturers Eng'g Service, who exhibited the Kam-Grip line of jigs. Quick acting clamps, for various fixtures and applications, were shown by Detroit Stamping Company and Cincinnati Tool Company.

Reams, for automatic screw machines, were exhibited by the Stites Tool Company, along with screw machine cutting tools, and by Weldon Tool Company, the latter also showing a wide line of cutting tools. Screws and dowel pins, hundred accessories, were exhibited by Strong, Carlisle & Hammond, Allen Mfg. Company, and Standard Pressed Steel Company, who also showed a broad line of industrial supplies.

"News" in Screw Cutting

Among screw cutting tools—and these were many and diversified—a new Cridan threading machine, by Lees-Bradner Co., produced precision machine threads at a rate comparable with the output of a wood screw machine. Other screw cutting tools were shown by Edward Blake Company (thread milling), Threadwell Tap & Die Company, and the Sheffield Corp'n. Power driven (hopper) screw driving equipment was exhibited by the Detroit Power Screw Driver Company. And this only hits the high spots.

Hydraulic and pneumatic equipment was available for about every possible industrial use. Air motors and accessories, by the Bellows Company, converted manually operated machine tools to semi or full automatic, while Bendix-Westinghouse exhibited a wide range of industrial air controls and air operated fixtures. A newly developed line of fittings, by Flodar Corp'n, withstands hydraulic pressures to several thousand lbs. without leakage.

Hydraulic pumps were shown by Gerotor May Corp'n and Racine Tool & Machine Co.; cylinders, valves and controls by Lindberg Eng'g Co., Miller Motor Co., Logansport Machine Co., and Hanna Eng'g Works. The latter had arranged a panel of rectilinear motions, actuated by cylinders and remote controls, that attracted keen interest. Hannifin Corp'n and Chicago Pneumatic Tool Company both exhibited high-pressure hydraulic riveting equipment along with cylinders, valves and other air and hydraulic appliances.

Mid-West Hydro-Pierce exhibited an interesting line of hydraulic piercing units and a hydraulic power plant. Pneumatic controls and safety appliances, as well as a broad line of air accessories, were exhibited by A. Schrader's Son, and air and hydraulic appliances by Modernaire Corp'n. Rotating and swing joints were included in a line of air and hydraulic appliances by C. B. Hunt & Son, and cycle controllers among a line of air and hydraulic valves by Sinclair Collins Valve Co.

Oil seals and lubricating devices were shown by Gitz Brothers, and centralized lubricating systems by Trabon Eng'g Corp'n and Lincoln Eng'g Company. Unusually complete lines of coolant pumps and accessories were shown by Ruthman Machinery Company and Pioneer Pump & Mfg. Company, both of whom are specialists in this line. An interesting line of Synclinal and sump type liquid filters was exhibited by Marvel Eng'g Company.

Since hydraulic fluids, lubricating oils and coolants are absolutely essential in manufacture, it may be assumed that the leaders in this field were well represented at the Exposition. Thus, Cities Service Oil Company, Socony Vacuum Oil Company, D. A. Stuart Oil Company, F. W. Anderson Oil Company, and the Texas Company, all had interesting and instructive exhibits, as did Cimcool Div'n of Cincinnati Milling & Grinding Machines, previously mentioned.

In the more or less specialized lines, Simplex Machine Tools Div'n of Stokerunit Corp'n exhibited a line of precision hydraulically operated boring machines and an automatic indexing trunnion fixture. Industrial clutches and brakes, and a punch press, were shown by Fawick Airflex Company, and a miscellaneous line of machine tools and industrial supplies by Tri-State Production Company. A very complete line of electrical control equipment and limit switches was shown by Micro Switch, while Eutectic Welding Alloys displayed an unusually broad assortment of welding rods and electrodes for about every conceivable application.

Since sawing and filing equipment play important roles in modern industry, tools in this category received their full share of attention. DoALL'S advanced contour sawing machines were ringed by the interested, and a new band sawing machine by Wells Mfg. Company, together with other sawing equipment by this company, also had its queue waiting for a close-up view. So did the line of continuous motion filing machines, supplemented with contour metal band sawing machines and saw blade butt welders, by Grob Brothers. Circular automatic sawing machines were exhibited by Motch & Merryweather, and a horizontal band saw machine by Kalamazoo Tank & Silo Company.

Hand and power hack saw blades were exhibited by W. O. Barnes Company and Spartan Saw Works, the latter also showing hacksaw frames. Rice Pump & Machinery Company exhibited Milwaukee die filing machines and grinders, while hand and rotary files were displayed by Heller Brothers Company. Together with the extensive line of hand, rotary and milled curved tooth files by Nicholson File Company, the visitor could read about the last word in this class of equipment.

Visitors could also read the last word in precision measuring instruments at the Exposition. Exhibiting automatic inspection tools were Sheffield Corp'n, Federal Products Corp'n, and DoAll Company, these concerns also showing a diversified line of air, electric and electronic measuring equipment along with miscellaneous measuring tools and machinists' tools; and Cleveland Republic Tool Co. a new indexing inspection device.

Gage blocks, among other measuring instruments, were shown by Fonda Gage Company, Taft-Peirce Mfg. Co., Webber Gage Company, Pratt & Whitney Div'n and Swedish Gage Co. of America, the latter also showing a line of precision gages ranging from dial indicators and surface finish gages to micrometers. Pneumatic comparator gages were shown by Merz Engineering Company and Moore Products Company. L. S. Starrett Company exhibited a line of mechanics' hand measuring tools and precision instruments, as did Lufkin Rule Company.

Dial bore and micrometer gages, in addition to other precision instruments, were shown by the B. C. Ames Company, Standard Gage Company, and Nilsson Gage Company. Physicists Research Company displayed its latest developments in surface finish testing equipment. Thread plug and ring gages, some for similar, some for overlapping needs, were shown by Republic Gage Company, Perfex Gage & Tool Co. and N. A. Woodworth Co. Similar gages, together with lead testing instruments, were shown by Pratt & Whitney Div'n. Thread plug and ring gages were also shown by Locke Gage Company. Rockwell hardness testers were exhibited by Wilson Mechanical Instrument Company.

Size Control Company's extensive display included a granite surface plate, while Tatra Tool Company exhibited a double deck surface plate together with straight edges, angles and inspection V-blocks. Sapphire tipt micrometers and sapphire surfaced gages were shown by Sapphire Products Div'n of Elgin Nat'l Watch Company. Also among the interesting gages was a universal comparator gage by Dow Chemical Company.

Well, that covers the highlights, the Exposition as a whole being just too big to cover in any one issue of a magazine.

Record-Breaking A.S.T.E. Exposition Emphasizes Advances in Tooling

By Doris B. Pratt

PRESENTED TO a strictly invitational attendance of 63,542, the Tool Engineers' Industrial Exposition at Cleveland Public Auditorium, March 15-19, chalked up a record for crowds, sales, and enthusiasm for the highly educational array of latest tooling developments.

The 17,520 registrants returned again and again during the five-day show, to inspect the 326 exhibits occupying 220,000 square feet in four big exhibit halls.

Earliest arrivals were H. A. Diehl and H. B. Garrison of R. G. LeTourneau, Inc., who flew in from Longview, Texas, reaching the Exposition building at 7:55 A.M. Monday morning. By 9:00 o'clock, the official opening hour, a throng was milling around the registration desk. From then on there was a steady influx of representatives of the metal working industry.

First-time visitors to an ASTE show were amazed at the almost-universal booth demonstrations and the wide coverage of the field. Some frankly admitted that they had expected exhibits mostly limited to small tools and gadgets displayed in showcases.

Exhibitors were equally delighted with the select audience and almost complete lack of "sightseers" viewing their products.

Emphasis of the tools, machines and techniques exhibited was on greater production with minimum outlay in labor, material, machinery, and worker energy. Highlights of the exhibits are reviewed in the technical section of this issue.

Noticeable, too, were improved designs, protective features and automatic devices, making machine operation practically a white collar job.

The show provided an international interchange of ideas, with production men present from Canada, England, France, Belgium, Norway, Sweden, Finland, Scotland, Switzerland, Czechoslovakia, Denmark, Argentina, Chile and India. Among the British delegation were 12 members of The Gauge and

At every exhibit visitors talk over production problems with booth attendants. Crowds thronging this aisle were repeated throughout the four halls of the Exposition

1. President I. F. Holland announces committee chairmen to serve during his administration. 2. Playing to "standing room only" is the Navy's continuous showing of the Bikini atom bomb test film. 3. First to arrive at the Exposition, H. B. Garrison and H. A. Diehl (center) of R. G. LeTourneau, Inc., are greeted by outgoing and incoming Presidents W. B. Peirce and I. F. Holland, after flying in from Longview, Texas. 4. James D. Mooney (center), President and Board Chairman of Willys-Overland Motors, chats with Presidents Holland and Peirce during banquet reception preceding his address to Society. 5. East meets west as tomorrow's tool engineers from India and Sweden get together at ASTE Annual Meeting. From left: Detroit Chapter member Guruswamy Ramakrishman, Engineer, Government of India, now with National Acme Co., Cleveland; Hakon Ehrenborg, Engineer, AB Wilh. Sonesson & Co., Stockholm, Sweden; Framroze N. Patel, India, with Warner & Swasey Co., Cleveland; and Koppula Subrahmanyan, Madras, India, University of Michigan student, as were his two compatriots. Indian youths speak different tongues, can converse together only in English

Tool Makers' Association, in America primarily to see the Exposition.

Visitors also included several student groups from engineering schools, and three experts on rehabilitation of the blind, seeking new industrial jobs for sightless workers.

Especially attractive was the U.S. Navy exhibit showing a jet propulsion engine, cutaway of a Pratt & Whitney radial engine developing 2100 hp. at 2800 rpm, "Tiny Tim"—a jet propelled rocket, and other military equipment. Here many ASTE members saw ordnance materiel which they had helped tool.

The exhibit was in charge of an ASTE member, Commander A. M. Johnson of the Bureau of Ships, Washington, D. C.

A daily tabloid, giving news of the show and concurrent annual convention, was issued by the National Public Relations Committee under the supervision of J. M. Cannon, Public Relations Director.

Mr. Cannon also conducted a press room and arranged for ASTE officers, members and guests to participate in a number of radio broadcasts. These included a television program, a weekly evening feature recorded at the show, and several newscasts.

C. V. Briner of Cleveland, a Past President of the Society, was Chairman of the successful Exposition. On his committee were L. F. Hawes, Los Angeles Chapter Chairman, R. H. Morris, Hartford, Conn.; and A. M. Sargent, Detroit, Mich., both former Presidents.

H. E. Conrad, Executive Secretary, was Exposition Manager, with J. V. Friel of Reber-Friel Co. as Exhibit Manager. Registration was directed by C. J. Hasse, Office Manager at the Detroit headquarters, assisted by Central Office and Cleveland Convention Bureau personnel.

* * *

Streamlined to avoid conflict with show activities, the technical program was limited to three evening sessions of exceptional caliber.

The first featured A. H. Mogensen, industrial consultant, in an outstanding exposition of "Work Handling Simplification."

Differentiating between a 71% machine working time and a 23% actual "do" time, Mr. Mogensen showed with charts and films step-by-step stages in reducing handling time, improving operator efficiency, and increasing machine productivity—all without investment in special equipment.

A work simplification program, he cautioned, must be initiated at the top, without criticism of prevailing methods, and with a guarantee to workers that

Left: At the Navy's exhibit W. S. Taylor, Delco Products Div., G.M.C., Dayton, and Commander A. M. Johnson, U.S. Bureau of Ships, read inscription of replica of bronze tablet commemorating signing of surrender papers on U.S.S. Missouri by Japanese. Right: S. A. Mathews, Chief Tool and Process Engineer, Chevrolet-Saginaw Service Mfg.; J. Fowler, Master Mechanic, Chevrolet Service Mfg. plant; and Capt. K. A. Walsh, U.S.M.C. and combat aviator representing Navy Bureau of Aeronautics, compare notes on production and performance of Navy's Pratt & Whitney 2100 hp., radial aircraft engine (shown in cutaway model). Mr. Fowler worked on big engine at Buffalo. Captain Walsh's service ribbons represent Congressional Medal of Honor, six Distinguished Flying Crosses, 14 Air Medals, Good Conduct Medal with Star, and other awards

unemployment will not result from job displacement.

Second session was a discussion of "Metallurgical Control of Deep Drawn Stampings" by N. E. Rothenthaler, Ford Motor Co. production executive. Factors influencing surface quality and internal quality were described, as well as stress patterns and operating conditions to be watched.

A quarter-size model of a front fender, most difficult drawing part in automobile stamping, was used to illustrate points discussed. Slides also were shown.

Final technical meeting was a "Tool Engineers' Quiz." Selected questions previously submitted by ASTE members were tossed in the laps of a board of experts. The forum panel included: A. H. d'Arcambal, V.-Pres., Pratt & Whitney; J. K. Fulks, V.-Pres. in charge of Mfg., Ex-Cell-O Corp.

Emil Gairing, Pres., Gairing Tool Co.; G. H. Sanborn, Chief Field Engineer, Fellows Gear Shaper Co.; W. H. Oldacre, Pres. and Gen. Mgr., D. A. Stuart Oil Co.; O. W. Winter, Pres., Acme Pattern & Machine Co.; Mr. Mogensen and Mr. Rothenthaler. Program Chairman R. W. Ford served as moderator.

Proponents of the prepared "Quiz" problems were awarded certificates of appreciation and will receive complimentary copies of the forthcoming "Tool Engineers' Handbook." They are: C. C. Gorham (Boston Chapter); W. F. Stump (Toledo); William Dettmar (Louisville); A. O. Schmidt (Milwaukee).

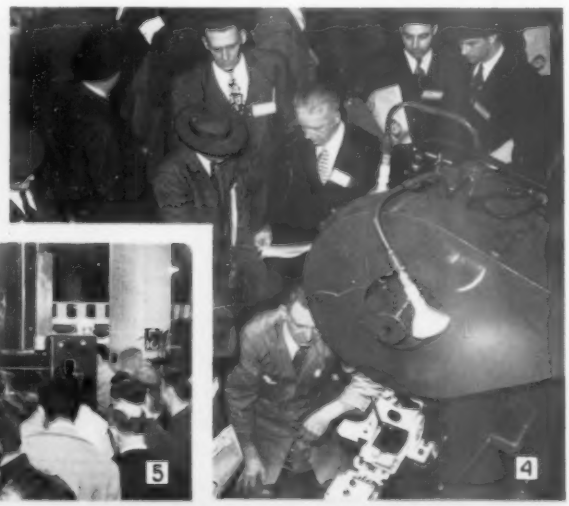
H. C. Hook (Springfield, Mass.); G. W. Fleming (Northern New Jersey); Prof. W. A. MacCrehan, Jr. (Boston); L. H. Tenney (Mid-Hudson); R. E. Johnson (Rockford); L. P. Tarasov (Worcester); William Chunn (Los Angeles); J. F. Miller (Detroit); C. C. Jordan, Jr. (Buffalo-Niagara Frontier); F. I. Johnson (Fond du Lac).

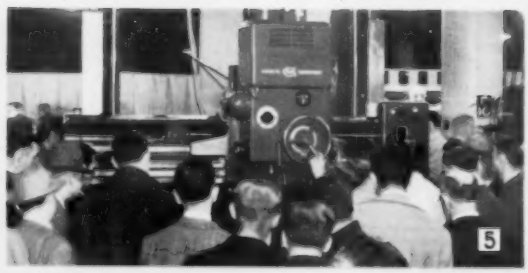
Marvin Kirchhoff (Cleveland); E. C. Varnum (Rockford); J. H. Thomas (Pittsburgh); M. W. Preising (Philadelphia); W. H. McGlothlin (Flint); C. R. Sivits (Toledo); H. Zimmermann (St. Louis); J. L. Wright (Cedar Rapids); Lincoln Mager (Los Angeles); R. W. Bollier (Rockford); and J. F. Glitzenstein (Cleveland).

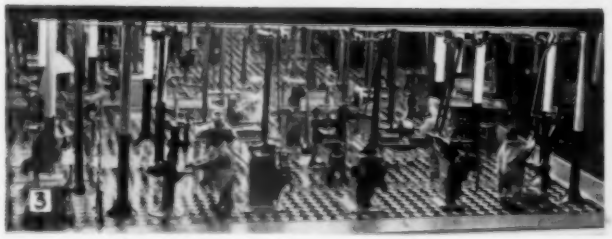
* * *

The need for economy in Society operations to cope with rising costs keynoted

1. Exhibits were readily accessible as in this booth where visitors are getting close-up of gaging devices. 2. Demonstration of impact tool brings questions from interested spectators. 3. One of the most popular attractions were this model machine shop with belt driven machines all in operation. Built about 1890 by anonymous European tool and die maker, it required 17,000 hours to complete. Scale is ¾ inch to foot. 4. An operator explains hydraulic stock feed while another attendant describes applications. 5. Big hydroptic, #7 jig boring and milling machine from Switzerland was another center of interest. 6. Turret lathe demonstration fascinates this audience







Top, left: National Program Committee entertains technical speakers at dinner. Around table, from left: E. W. Baumgardner, R. W. Ford, F. J. Schmitt, H. E. Conrad, Executive Secretary; W. B. Peirce, President; G. H. Sanborn, Fellows Gear Shaper Co.; W. H. Oldacre, D. A. Stuart Oil Co.; J. K. Fulks, Ex-Cell-O Corp.; Emil Gairing, Gairing Tool Co.; A. H. Mogensen, industrial consultant; O. W. Winter, Acme Pattern & Machine Co.; N. E. Rothenthaler, Ford Motor Co. Standing: A. D. Lewis, H. M. Windsor, Secretary to Program Com.; A. H. d'Arcambal, Pratt & Whitney; and G. A. Rogers.

Right: Success of local convention events and arrangements was due to efforts of Host Chapter Committee. Seated, from left: J. H. Schron, Budget Chm.; R. R. Rhodehamel, Social Program; E. W. Baumgardner, General Chairman; H. B. Osborn, Jr., Technical Program; G. A. Hier, Plant Tours. Standing: E. R. Dase, E. H. Dawson, J. O. Brigleb, H. E. Peiffer, Emergency; D. H. Compoundu, R. C. Southwell, Transportation; J. R. Fitzsimmons, Entertainment; A. B. Clark, Physical Arrangements; C. W. Scheihing, Reception Co-Chm.; and W. R. Wyatt. Below: Mr. Fulks answers questions at "Quiz"

the Board of Directors meeting, held March 17 with President W. B. Peirce presiding.

Important business transacted included election of national officers as reported in the April issue, scheduling of the next two national meetings, change in Affiliate Membership dues, initiation fee and Chapter allocation; and a decision to hold nine regional meetings.

The Directors also voted to earmark $50,000 of Exposition proceeds for a headquarters building fund, with all additional show revenue to be held in reserve for general operations as approved by the Board.

Semi-annual meetings are to be gradually reduced in scope and efforts concentrated on sponsoring area meetings to include all Chapters. Schedule for the 1948 regional meetings and their chairmen follows: May 15, Canadian, Toronto, Ont., W. A. Dawson.

May 16, Middle Atlantic, Philadelphia, Pa., I. F. Holland; May 23, South Central, Cincinnati, Ohio, G. A. Goodwin; June 6, Southwest, Fort Worth, Texas, W. B. McClellan and H. L. Tigges; June 13, Rochester, N. Y., R. B. Douglas; and Northwest, Portland, Ore., W. B. Peirce, date to be announced.

Regional conferences already held include: Far West, Los Angeles, Calif., May 1; E. W. Baumgardner, Chairman; New England, Worcester, Mass., May 2, V. H. Ericson; and Mid-Western, Chicago, Ill., May 9, W. B. McClellan.

A By-Law revision increases Affiliate Membership dues from $25 to $50, eliminates the $10 initiation fee, and provides for 75% Chapter allocation of dues for this grade.

Dates established for the Semi-Annual Meeting at Los Angeles, Calif., are October 11, 12, 13. Next year's Annual Meeting is planned for March 10, 11, 12 at Pittsburgh, Pa.

Handbook Chairman E. W. Ernst reported that the completed manuscript of 5000 typewritten pages is now being set in type. Publication of the 1800-page book is expected the latter part of the year.

Data sheets from 60 suppliers are in process, Standards Chairman W. H. Smila told the Board, while assignments to Chapter Standards Committees involve prospective sheets from over 500 manufacturers, in addition to those being readied for distribution in the Dominion by the Canadian National Standards Committee.

The standardization program undertaken in conjunction with ASA will currently concentrate on B-5, Small Tools and Machine Tool Elements; and B-52, Classification of Materials for Tools, Fixtures and Gages.

More colleges and engineering schools are showing interest in tool engineering courses, according to National Education Chairman O. W. Winter.

A new printing of "Jig and Fixture Design," combining Books 1 and 2 in a single cloth binding, is under way.

Encouraging progress was seen in the number of Chapters offering lecture courses and scholarships.

The Tool Engineer reached a new peak, Editorial Chairman W. B. McClellan stated, with the March Exposition issue, largest in the Society's history.

The comprehensive study made by R. B. Douglas, Chairman of the Committee on Professional Registration, pointed out

A capacity audience assembles for one of the evening technical sessions held in conjunction with ASTE show

1. Directors and National Officers listen to a committee report during annual meeting of Board. From left around table: G. S. Wilcox, Jr., H. L. Tigges, A. M. Sargent, C. V. Briner, V. H. Ericson, stenotypist, R. B. Douglas, I. F. Holland, W. B. Peirce, H. E. Conrad, W. A. Dawson, G. C. Johnson, C. B. Cole, K. L. Bues, H. E. Collins and T. J. Donovan, Jr. 2. National Committee Chairmen give close attention to Board discussion of a Society project. 1st row, from left: J. J. Demuth, R. W. Ford, W. H. Smila and G. A. Goodwin; 2nd row: O. W. Winter and W. B. McClellan. 3. Alternates stand by ready to serve if needed at House of Delegates meeting. 1st row: Albert Hage, Toledo; V. A. Peck, Erie; J. G. Swardenski, Peoria; W. G. Ehrhardt, St. Louis; H. O. Simon, Rochester; and D. E. Mackenzie, Houston. 2nd row: J. W. Lengbridge, Toronto; Lorin Hayden, Cincinnati; James Allison, Akron; E. V. Johnson, Dayton; W. F. Jarvis, Hartford; A. F. Kurtz, Muncie; J. A. Black, Louisville; P. A. Patterson, Philadelphia; Andrew Carnegie, Detroit; Ernest Anderson, Madison; and H. W. Ryno, Northern New Jersey. 4. Progress of The Tool Engineer is discussed at meeting of National Editorial Committee. From left: Anton Peck, K. C. Jasper, F. C. Koehn, A. E. Rylander, Technical Editor; W. B. McClellan, Chairman; J. A. Lapham, D. B. Pratt, ASTE News Editor; M. J. Radecki and R. B. Powers, Executive Editor. 5. H. F. Volz, Membership Chairman, gives his committee tips on boosting Society nose count. From left: L. M. Cole, G. A. Exley, Mr. Volz, J. O. Knight, H. D. Mozeen, E. W. Dickett, W. W. Appleton, C. J. Lindegren and F. J. Dawless

6. Chapters sent their representatives to elect Board of Directors at House of Delegates meeting. 1st row, from left: B. J. Hazewinkel, Denver; G. A. Exley, Williamsport; Albert Schlattner, Cincinnati; W. E. L. Bock, Columbus; 2nd row: E. J. Raves, Golden Gate and Portland, Ore.; P. H. Magnus, Pittsburgh; E. W. Mellin, Fort Wayne; L. N. Dahlen, Tri-Cities; R. P. Thayer, Potomac; G. H. Balentine, Atlanta; Wayne Kay, Detroit; T. F. Burke, Baltimore; J. A. McMonagle, Philadelphia. 3rd row: R. G. Frogness, Fox River Valley; D. F. Saurenman, Houston; R. A. Smith, Hartford; A. D. Lewis, San Diego; R. L. Waters, Muncie; H. A. Nelson, Rockford; R. E. Bestine, Cedar Rapids; W. E. Boker, Twin City; L. B. Penland, Richmond. 4th row: Anton Peck, Los Angeles; R. C. Kolb, Peoria; P. E. Beeler, South Bend; Charles Kotersall, Cleveland; F. J. Schmitt, Chicago; M. H. Hetzel, Erie; M. L. Roessel, Rochester; J. L. Petz, Mid-Hudson. 5th row: F. H. Kessenich, Madison; P. O. Wernicke, Milwaukee; J. P. Schommer, Fond du Lac; G. S. Clarke, Montreal; I. H. Buck, North Texas; R. T. Richards, Windsor; A. J. Rhodes, Pontiac; G. A. Irwin, Akron. 6th row: John Horton, Indianapolis; R. E. Gifford, New Haven, F. J. McArthur, Twin States; R. B. Parker, Little Rhody; J. X. Ryneska, Boston; C. H. Stonerod, Springfield, Mass.; C. W. Monigle, Worcester; Edward Ruder, St. Louis; A. J. Pangburn, Binghamton. 7th row: L. M. Jardine, Toronto; E. W. Ernst, Schenectady; C. J. Gluck, Fairfield County; H. C. Klix, Syracuse; H. J. Bales, Wichita; N. F. Snyder, Flint; W. L. Sandham, Niagara District; G. C. Tillotson, Dayton; F. E. Hardy, Jr., Decatur. 8th row: C. W. Patton, Springfield, Ohio; A. F. Kirchgessner, Buffalo-Niagara Frontier; W. B. Alexander, Hamilton; P.P. Stock, Central Penna.; R. M. Hindman, Toledo; J. L. Webster, Northern New Jersey; and H. L. Horton, Greater New York. President Peirce swore in Delegates. F. J. Schmitt was elected Chairman of body

the pitfalls of compulsory registration laws requiring the licensing of all engineers. He recommended supporting existing "permissive" legislation as opposed to compulsory regulation of "practice where the public welfare is not involved."

H. F. Volz, Membership Chairman, announced activity towards formation of Chapters in the London-St. Thomas, Ont., area; Des-Moines-Marshalltown-Newton, Iowa; Memphis, Tenn.; and New Bedford, Mass.

Trade papers, newspapers, and general circulation periodicals are devoting an impressive amount of space to publicizing the Society's activities, through the efforts of the Public Relations Committee, Chairman H. B. Obsorn, Jr., informed the Directors.

Proposals included a plan for informing industrialists about tool engineering and its importance to manufacturing processes, and an offer to cooperate with the Program Committee in establishing a speakers bureau.

National Program Chairman R. W. Ford recommended assisting Chapters through area meetings and in planning better programs. His report also projected plans for arranging speaker tours of West Coast Chapters and for issuing occasional bulletins with current speaker and film information.

Member experience in war production activities should be surveyed for use in a future emergency, National Secretary W. A. Dawson emphasized while summarizing overall Society activities and progress. Another public service suggested was the collection and distribution of used copies of *The Tool Engineer* for libraries in devastated countries.

Reviewing operations and services rendered by the Central Office, Executive Secretary H. E. Conrad observed that headquarters personnel assigned to National Committees should be utilized further in carrying out Chapter activities and by Committees having no regular staff at the Detroit office.

An association of Past Presidents, formed as a social group, was announced by J. A. Siegel, Chairman of the Honor Awards-Judicial Committee. A. H. d'Arcambal, organizer of the new activity, has been named Chairman.

National Secretary W. A. Dawson and Third Vice-President G. C. Johnson were voted certificates of meritorious service

upon their retirement from office.

Two Honorary Memberships were awarded by the House of Delegates in a meeting March 18. The president of the Institution of Production Engineers, Great Britain, and his successors will be Honorary Members of the Society during their term of office. Two years ago IPE conferred a similar honor on ASTE.

James Y. Scott, President, Van Norman Co., was named by the Board of Directors as special emissary to present the membership at a meeting of the British organization in Wolverhampton, England, May 28. Mr. Scott will also represent the Society at an International Production Man-Hours Conference there.

For outstanding achievements in vocational training and in securing nation-wide recognition of tool engineering as a separate course of college study, an Honorary Membership was bestowed on Donald M. Kidd, Director of Vocational Education at Syracuse, N.Y.

Mr. Kidd was cited as "father of one of the most progressive vocational training systems," inaugurating shop courses for depression-idled workers, and promoting a technical high school.

A resolution was adopted by the House commending Toronto Chapter for an action inaugurated by R. E. Crawford in presenting $25 to Portland, Maine, Chapter to help defray expenses of a Delegate.

Principal business of the Delegates was the election of Directors, reported in the April *ASTE News*.

F. J. Schmitt, Chicago Delegate, was elected Chairman of the House and presided over the session. Anton Peck, Delegate for Los Angeles and San Diego Chapters, was re-elected Permanent Recorder, and C. W. Monigle, Worcester, was voted Delegate-at-Large.

A Credentials Committee, composed of Alternates A. D. Lewis, Los Angeles; R. B. Parker, Little Rhody; and Wayne Kay, Detroit; checked credentials of the Chapter representatives.

Retiring President W. B. Peirce

1. President Holland presents Life Membership Certificate to his retiring predecessor, W. B. Peirce. 2. J. D. Mooney, Willys-Overland head, says engineer should share in reconstruction problems as well as in war production. 3. More than 700 members and guests enjoy annual dinner festivities. 4. President Peirce swears in Cleveland Chapter officers, from left: J. O. Brigleb, Treas.; R. C. Southwell, Secy.; E. J. Marasco, 2nd V.-Chm.; G. A. Hier, 1st V.-Chm.; and J. H. Schron, Chm.; and (5) National Officers, from left: W. B. McClellan, Secy.; G. A. Goodwin, Treas.; V. H. Ericson, 3rd V.-Pres.; H. L. Tigges, 2nd V.-Pres.; R. B. Douglas, 1st V.-Pres.; and I. F. Holland, Pres. 6. Several members of official family chat informally at banquet reception. 7. Officers and distinguished guests line speakers' table. From left: E. W. Baumgardner, Host Chapter Com. Chm.; W. K. Bailey, V.-Pres.; Warner & Swasey Co.; W. A. Dawson, retiring Natl. Secy.; W. B. McClellan, Natl. Secy.; G. A. Goodwin, Natl. Treas.; V. H. Ericson, retiring Natl. Treas.; R. B. Douglas, 1st V.-Pres.; I. F. Holland, Pres.; W. B. Peirce, retiring Pres.; J. D. Mooney, Pres. and Bd. Chm., Willys-Overland Motors (guest speaker); H. E. Conrad, Exec. Secy.; C. E. Bleicher, Pres. and Gen. Mgr., DeSoto Div., Chrysler Corp.; A. M. Sargent and C. V. Briner, Past Presidents; H. L. Tignes, 2nd V.-Pres.; and Directors G. S. Wilcox, Jr., T. J. Donovan, Jr., C. B. Cole, K. L. Bues and H. E. Collins

1. Show committee and officers inspect program and exhibit guide at Sunday evening preview of Exposition. From left: I. F. Holland, '48 Pres.; V. H. Ericson, '48 3rd V.-Pres.; W. B. Peirce, '47 Pres.; C. V. Briner, Exposition Chm.; H. E. Conrad, Exposition Mgr.; and L. F. Hawes of Mr. Briner's committee. 2. "Zero hour." At exactly 9:00 A.M., show opening hour, registration desk presented this scene. 3. Mr. Hawes is interviewed at Exposition by Don Gabriel of WJW's "Let's Go Visiting" program. 4. Delegation from Gauge and Tool Makers' Association arrives from England to see Exposition, is greeted at Union Terminal by Mr. Hollard and Mr. Peirce. From left: First man unidentified, A. C. King, Dir., King Tool & Gauge, Ltd.; R. G. McArd, Mg'g. Dir., Robert McArd & Co., Ltd.; G. F. Clarke, Mg'g. Dir., George F. Clark & Sons; fourth man unidentified, J. Goulder, Dir., Monarch Tool Co., Ltd.; E. Slater, Mg'g. Dir., Slater & Crabtree, Ltd., and acting Chairman of group; N. Rolaston, Chief Eng., B.I.P. Tools, Ltd.; Mr. Holland; J. V. Murcott, Engr., Beetle Products Co., Ltd.; A. C. Bishop and H. Holder, Directors, Holder & Bishop, Ltd.; H. G. Brown Engr., B.I.P. Tools, Ltd.; G. T. Beach, Association Secretary; A. R. Betteridge, Mg'g. Dir., Liverpool Supply Turned Parts, Ltd., and President Peirce

opened the meeting and swore in the members of the House.

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Other groups meeting during the convention included the Editorial, Membership, and Education Committees.

Past Presidents were honored at a luncheon where President Peirce presented each with a diamond-set emblem similar to the ASTE Past Chairman pin. Nearly 50 members of Canadian Chapters gathered for a get-acquainted breakfast.

Assembling for the annual dinner and national membership meeting some 700 members and other show and convention visitors heard James D. Mooney, Willys-Overland President and Board Chairman, express his views on "American Participation in European Recovery."

Practical power politics, he feels, should supplant "threadbare idealogical terms" in handling the international situation. The way to peace, Mr. Mooney stated, lies in maintaining our own production and military strength; assisting Britain in rebuilding hers; cooperating with the British in restoring France's position among leading Western powers; and in working with both nations to re-establish German production for the benefit of Western Europe and the British Isles.

Recommending that skilled industrial management personnel be enlisted to administer the recovery program, Mr. Mooney pointed out that the engineer is pressed into service for war production, but is shoved aside when peace comes although he is more at home in these construction problems.

Installation of the newly-elected National Officers was conducted by retiring President W. B. Peirce. Taking the oath of office were: I. F. Holland, Pres., R. B. Douglas, 1st V.-Pres., H. L. Tigges, 2nd V.-Pres., V. H. Ericson, 3rd V.-Pres., W. B. McClellan, Secy.; and G. A. Goodwin, Treas.

Mr. Peirce also swore in the following Cleveland Chapter officers: J. H. Schron, Chm.; G. A. Hier, 1st V.-Chm.; E. J. Marasco, 2nd V.-Chm.; R. C. Southwell, Secy.; and J. O. Brigleb, Treas.

President Holland presented a Life Membership certificate and a Past President's pin to Mr. Peirce. The outgoing President also received a gift from the National Officers and Directors, Mr. Ericson making the presentation.

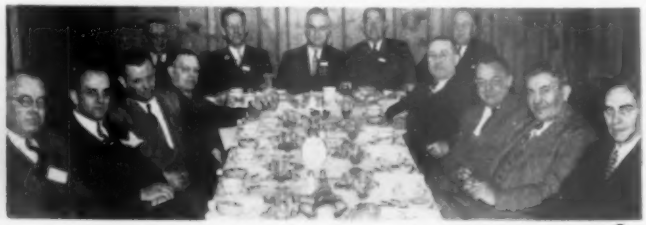
Award of the National Membership Trophy was made by Membership Chairman H. F. Volz to Rochester Chapter, 1947 winner. Milton Roessel, Chairman for '47-48, accepted the cup on behalf of his Chapter.

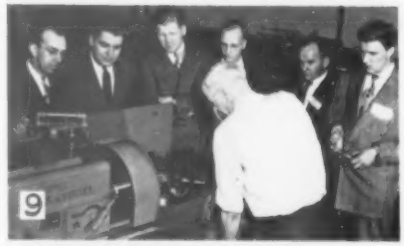
Cleveland Chapter's first annual $500 scholarship, awarded to T. H. Rogers, junior in Mechanical Engineering at Case Institute of Technology, Cleveland, was presented by Walter Bailey, V.-Pres. of Warner & Swasey Co. and Chairman of a committee of industrialists who selected the winner. Mr. Rogers was chosen over students of engineering colleges throughout the country.

National Committee Chairmen appointments announced by President Holland included the following: Constitution and By-Laws, D. R. Linch (Los Angeles Chapter); Editorial, F. W. Curtis (Springfield, Mass.); Education, Prof. H. F. Owen (Indianapolis); Handbook, E. W. Ernst (Schenectady).

Housing, A. M. Sargent; and Judicial Honor Awards, J. A. Siegel (Detroit); Membership, F. J. Dawless (New Haven); Professional Engineering, W. A. Dawson (Hamilton); Program, E. W. Baumgardner; and Public Relations,

Dr. H. B. Osborn, Jr., ASTE Public Relations Chm., tells WSRS listeners how mass production methods bring them more goods at lower costs. Also on broadcast are: T. H. Rogers, Cleveland Chapter scholarship winner; Chick Lind, announcer; and Carl C. Harrington, Editor, Mill & Factory. Right: Past Presidents of the Society are honored at luncheon, presented jewelled pins. From left around table: A. H. d'Arcambal, O. W. Winter, T. B. Carpenter, R. M. Lippard, W. H. Smila (end of head table), A. M. Sargent, J. A. Siegel, W. B. Peirce, President; W. F. Wagner; right side of table: James R. Weaver, C. V. Briner, Ray H. Morris and D. D. Burnside





1. This bus party was among 2800 production men who took advantage of hospitality of Cleveland plants. 2. Gear shaving operation holds interest of visitors to White Motor Co. 3. E. A. Lindsay, G. E. lighting expert, lectures before group who toured Nela Park. 4. Guests of White Motor Co. query a workman on the production of a part for the Hydro-Torque automatic bus transmission and (5) at another point a lively discussion centers around machining of axle shafts as engineers probe automotive tooling problems. 6. In the Industrial Lighting Room at Nela Park, four visiting delegates measure lighting at a lathe, with a light meter. From left: Herman Goerckermann, Milwaukee; N. F. Smith and S. E. Perez, Ithaca, N.Y., and R.P. Thayer, Alexandria, Va. 7. Watching the insertion of stator coils at the Electric Motor division of Jack & Heintz Precision Industries, Inc., are Axel Mannheimer, Gothenburg, Sweden; William Dattmar and C. L. Metz, Louisville, Ky.; G. W. Lohf, W. S. Freeburg, H. F. Goerckermann and A. H. Bostater, Milwaukee, Wis.; H. S. Baldwin, F. W. Helming and J. J. Lannon, Waterbury, Conn. 8. At the stator sub-assembly merry-go-round, leads are inserted, joints are formed and soldered, and restraining ties are completed. Observers are: L. B. Jones and O. W. McIntyre, San Francisco, Calif.; George Tobler, F. W. Luik, B. D. Miller and Harold Gaines, St. Louis, Mo.; C. Geske, Grandville, Mich.; J. A. Nellis, Dayton, Ohio; A. H. Tibbits, Jr., Dearborn, Mich.; K. W. Fritch, Los Angeles, Calif.; G. G. Hahn, Fort Wayne, Ind.; and Jerry Stone, Houston, Texas. 9. Warner & Swasey guests pause while Charles Pavlin demonstrates company's new electro-cycle turret lathe. Around machine from left: C. P. Lowell, J. P. Vedenko and K. O. Tech, Detroit, Mich.; W. J. Brown, W & S Co.; D. Ostman and D. L. Dressler, Minneapolis, Minn. 10. In the Textile Machinery Assembly Dept., looking on during a timing test on a W & S pin drafting machine are, from left: E. L. Schelling, Dayton, Ohio; H. W. Yocum, Conshohocken, Pa.; G. R. Fullerton, Whitinsville, Mass.; R. M. Blair, Dayton, Ohio; Louis Joseph, Buffalo, N.Y.; Jack Lipman, International Correspondence Schools; and D. P. Markowitz of the host plant

H. B. Osborn, Jr. (Cleveland); Standards, L. B. Bellamy (Detroit).

A highly entertaining floor show concluded the banquet program.

* * *

Throughout the five days of the Exposition, ten Cleveland manufacturers and two research centers held open house to approximately 2800 Society visitors in more than 30 plant tours.

The wide variety of tools employed in the automotive industry were seen by about 200 engineers who made the trip to White Motor Co.

Two classifications of machine tool setups commanded attention. First, tooling to combine on one standard machine operations previously performed on as many as four machines; and second, specially designed machines incorporating standard heads and controls to meet product requirements.

Industrial lighting demonstrations and lectures were given before the four groups of 50 each who toured the General Electric Lighting Institute at Nela Park. Both quantity and quality of light came in for serious study and discussion. In addition the men learned the best ways to light homes and offices.

Equipment as varied as astronomical telescopes and earth moving machinery were seen in production at Warner & Swasey's. Highlights included the company's pin drafting and knitting machines for the textile industry, electro-cycle turret lathes, precision tapping and threading machines, and multiple spindle automatics.

Proceeding in small groups, some 250 ASTE'ers and guests viewed every part of the production process at Jack & Heintz Precision Industries, manufacturers of split-phase, capacitor-start and other types of motors.

Of particular interest was the completely conveyorized nature of the plant. Overhead, chain, pallet-type, slat, powered belt, and gravity roller conveyors are utilized in feeding the three major sub-assemblies (rotors, end bells, and stators) through inspection and into final assembly.

Restricted to U.S. citizens, inspection of the Flight Propulsion Research Laboratory of the National Advisory Committee for Aeronautics revealed newer types of aircraft engines which are constantly studied.

Besides engine testing, the ASTE party saw machine shops for making unobtainable parts, as well as metallurgical, heat treating and other laboratories.

Among other plants visited were The Weatherhead Co., National Acme Co., Republic Steel Corp., Fisher Body Div., General Motors Corp.; Ohio Crankshaft Co., The Reliance Electric & Engineering Co., and Willard Storage Battery Co.

Los Angeles Committee at Work on Convention Plans

Leslie F. Hawes, Los Angeles Chapter Chairman, will be General Chairman of the Host Chapter Committee for the Semi-Annual Meeting at Los Angeles, October 11, 12 and 13, the National Program Committee has announced.

On Mr. Hawes' staff are: Anton Peck, Plant Tour Chairman; John Ekstromer, Jr., Reservations and Registration; Harvey Groehn, Technical Programs; Wayne Ewing, Transportation; Merton W. Seavey, Banquet, and Physical Arrangements for Technical Sessions.

Joseph A. Parks and Richard R. Linch, Co-Chairmen of Entertainment; Robert H. Kollenborn, Emergency; Rudolf Regen, Publicity; G. J. Walkey, Supplementary Activities; Carl Wight, Records and Reports; Harold A. Miller, Tickets; Rudolph Powroznik, Budget; and Hans S. Bamberger, Signs.

The Committee has already lined up an extensive tentative program of local attractions, covering a wide range of plant tours, and an interesting itinerary of ladies' activities including Hollywood tours and trips to surrounding points and Mexico.

They will work with the National Program Committee, under the Chairmanship of E. W. Baumgardner of Cleveland, in developing this and the technical program. First joint meeting of the committees was held in Los Angeles, April 29-30.

The California convention offers a splendid opportunity for a family vacation trip to the West Coast at minimum cost. Itinerary and rates for a special convention train with sidetrips and optional returns are listed on a colored insert elsewhere in this issue.

Members are urged to use the return post card to indicate interest in taking advantage of the economical transportation offer.

Hammill in New Post

Toledo, Ohio—Edward Hammill of Toledo Chapter is now associated with the Ford Machinery Co. as Sales Engineer.

For the past three years until their recent closing, he has served Avco Tool Co. in a similar capacity. During the war period he was a tool engineer for Willys-Overland Motors, Inc.

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Martin Shows 300 Samples Of Powdered Metal Parts

Grand Rapids, Mich.—"Powder Metallurgy" was the topic presented by Douglas B. Martin, Sales Mgr., Amplex Mfg. Co., Div. of Chrysler Corp., at the March 8 meeting of Western Michigan Chapter.

D. B. Martin

The presentation consisted of a set of narrated slides illustrating the process and operations in fabricating various machine and tool parts. A brief history on the development of powder metallurgy was also given. Industrial applications were clearly illustrated. Mr. Martin answered questions from the audience for nearly an hour after the lecture.

A display of 300 sample parts showed numerous applications of powder metallurgy in various fields of industry.

Ladies See Installation Of Boston Officers

Boston, Mass.—Installation ceremonies and the first annual ladies night of Boston Chapter were combined in a pleasant and memorable social function, March 12, at the Hotel Vendome.

Retiring National Treasurer V. H. Ericson was installing officer, administering the oath to: W. W. Young, Chairman; P. J. Crosby, First Vice-Chairman; A. J. Leone, Second Vice-Chairman; W. C. Swanson, Secretary; and W. B. Wells, Treasurer.

Mr. Young received the Chapter Chairman pin and retiring Chairman J. X. Ryneska was presented with a Past Chairman emblem.

Headlining the entertainment program was a demonstration of nonsensical inventions by "Prof." Russell E. Oakes, the "Wizard of Waukesha." Amusing devices, such as a novel spaghetti fork, a self-finding golf ball, and a cigarette lighter reminiscent of "Rube Goldberg," kept the audience of more than 200 members, guests and ladies in hilarity.

Dinner and dance music was furnished by Jacques Renard and his orchestra.

A company of more than 200 initiated Ladies' Night at Boston Chapter. Officers installed during evening are at speakers' table with their guests. From left: "Prof." R. E. Oakes, entertainer; Mrs. W. C. Swanson; Secretary Swanson; Mrs. J. P. Crosby; First Vice-Chairman Crosby; Mrs. V. H. Ericson; retiring National Treasurer Ericson; J. X. Ryneska, retiring Chairman; W. W. Young, Chairman; Mrs. Ryneska; Mrs. Young; A. J. Leone, 2nd V.-Chm.; Mrs. Leone; Mrs. W. B. Wells, Treas. Wells

Colorado Tool Engineers Present "Twist Drill" Program

Braving a blizzard and ten below zero temperature, these Denver members turned out for March meeting of Chapter. Technical speaker was Harold Hurtt, District Representative for the Cleveland Twist Drill Co., who gave talk and showed a film on "The Use and Abuse of the Twist Drill." Incoming officers were installed during meeting

Auto Hardware Plant Minimizes Labor

Columbus, Ohio—The management of Fisher Body Ternstedt Div. of General Motors Corp. was host the evening of March 10 to 200 members and guests of Columbus Chapter. The plant tour attracted one of the largest turnouts ever attending a Chapter event.

The tour, made during the second shift when operations were going at capacity speed, was a revelation to most of the visitors, few of whom had ever witnessed a modern, automobile accessory plant in operation.

Of particular interest was the planning of production lines to eliminate all unnecessary labor, a concrete example of the value of motion study. Safety also is an important consideration in the 16½-acre factory where some 800 punch presses stamp out hardware for motor vehicles. Notable, too, was the cleanliness and orderliness of the plant.

After the tour, the group gathered in the lobby where G. S. Wilcox, Jr., ASTE Director, installed the newly-elected officers and delegates.

A. W. Montague, the incoming Chairman, presented his predecessor, W. E. L. Bock, with a Past Chairman pin and thanked him for his untiring efforts in behalf of the Chapter and the Society in general.

Raque Transferred

Louisville, Ky.—Frank P. Raque, Tool Engineer with the local plant of the American Radiator & Standard Sanitary Corp., is assuming new duties as an executive with the Richmond, Calif., plant.

During the past year, Mr. Raque served as Secretary of Richmond Chapter.

Morton and Brady in N. Y.

New York City—L. D. Morton has been named Eastern District Manager in charge of the new office recently opened here by Kennametal, Inc., of Latrobe, Pa. J. G. Brady will serve as Representative.

Mr. Morton has been a company representative at Cleveland, Ohio, and Mr. Brady, at Pittsburgh, Pa. They are members of Cleveland and Greater New York Chapters, ASTE, respectively.

31 Operations Performed By Automatic Machine

Chicago, Ill.—A sound film, showing the Greenlee automatic transfer process for machining refrigerator compressor bodies, was the technical feature at a meeting of Chicago Chapter, held April 5 in the Furniture Club.

This machine is a special 24-station unit that automatically processes workpieces to a predetermined cycle, using 152 tools to perform 31 machining operations on each part.

With the exception of a pushbutton depressed to start the cycle, the machine is fully automatic. A work holding fixture is placed in the loading station and two pieces are clamped in place. The starting button is pressed and the work holding plates advance to their respective stations. At completion of the transfer, elevated dowel pins rise and enter bushings in the fixtures, hydraulically clamping the latter.

Failure of clamping, unclamping, transfer or operating units to perform during any part of the cycle can be readily detected and the trouble located immediately by a system of lights on the operator's control panel.

After the work emerges from the discharge end of the machine, it is removed and washed. The fixture is also washed and returned to the loading end of the machine by a power-driven conveyor. In addition, there is a pincer-driven chip conveyor.

F. J. Schmitt, Delegate, reported on the Cleveland exposition and convention and T. C. Barber, Membership Chairman, discussed Committee activities, announcing that the Chapter ranks third in membership.

Chairman Harold Taylor conducted the meeting and outlined plans for the annual spring dance scheduled for May 26.

Made N.Y. Representative

Detroit, Mich.—Randall L. Kamischke has been appointed New York State representative for the U. S. Broach Co., according to an announcement by John Penny, President.

For three years prior to this appointment, Mr. Kamischke, a Detroit Chapter member, has served the company as Chief Engineer.

Egyptians Introduced Powder Metallurgy

St. Catharines, Ont.—Powder metallurgy was first practiced by the Egyptians, developed for modern production by the Germans in the early 19th century, with English and American manufacturers following closely in its adoption, D. B. Martin of the Amplex Mfg. Co., Div. of Chrysler Corp., told Niagara District members while lecturing on this subject March 25.

In America, according to the speaker, Chrysler fathered this process of pressing powdered metal to precision tolerances.

Metal powders such as iron, copper, zinc, tungsten and brass, he explained, are formed into briquets under pressures varying from 15,000 to 100,000 pounds psi. The briquets are then sintered in an oven, after which they are ready for use if the accuracy is satisfactory; otherwise, a final sizing with machine tools is necessary. Accuracy of parts as received from the oven can be controlled to .002 of an inch, Mr. Martin commented.

Articles that can be manufactured by this process include tungsten carbide cutting dies and gears, machine parts, self-lubricating bearings, and filters.

Following his address, Mr. Martin conducted a discussion concerning new applications and operating characteristics of powdered metal parts and bearings. He also displayed a large selection of sample parts.

Whitaker with Telco

Cleveland, Ohio—Ralph M. Whitaker has been appointed to the sales force of Telco, the Truman E. Longley Co., according to a company announcement.

R. M. Whitaker

Mr. Whitaker will supervise a new machinery division, expanding his activities and practical shop experience in the machinery business.

Well known in Cleveland Chapter, ASTE, he has served as Vice-Chairman of the Membership Committee and was Banquet Chairman for the recent Cleveland convention.

Speed Vital for Economy In Jet Propelled Planes

Toronto, Ont.—Known at least 300 years ago, jet engines are not new, announced R. V. Corlett, Chief Methods Engineer for DeHavilland Aircraft of Canada, Ltd., in opening his discussion of "Jet Propulsion" before Toronto Chapter, March 3.

An authority in this field, Mr. Corlett explained that a jet propelled plane becomes really efficient at 500 mph., whereas a propeller's efficiency declines rapidly after this speed has been attained. With 300 rpm. normal for idling rate, speed is essential for economy in jet propelled planes.

The speaker described the theory of jet propulsion, the engine, and future possibilities. Then he detailed manufacturing methods, including the entire assembly, and with the aid of a switchboard, demonstrated methods used in starting the engine.

An interested audience of 200 gained much from his exposition of every angle of the subject. A sound film illustrated many of the points previously made by Mr. Corlett.

L. M. Jardine, Chapter Chairman, called on W. A. Dawson, National Secretary, to install the incoming officers. After speaking briefly on Society affairs, Mr. Dawson inducted the following: John W. Lengbridge, Chairman; Fred Crook, First Vice-Chairman; Victor Davey, Second Vice-Chairman; Michael Hollo, Third Vice-Chairman; Harold Upton, Treasurer; John B. Burk, Secretary; L. M. Jardine, Delegate; and, as Alternate, Mr. Lengbridge.

Spend Your Vacation With ASTE

Read all about the special train offer for the Los Angeles convention, October 11-12-13. (See blue insert.)

Left: John Lengbridge, Toronto Chapter incoming Chairman, receives emblem of office from W. A. Dawson, retiring National Secretary. Right: Traditional transfer of giant gavel marks change of administration at Milwaukee Chapter. From left: Walter Behrend, Secretary; Paul Butzin, retiring Chairman; Waldemar Klein, Treasurer; Herbert Heimann, Second Vice-Chairman; Joseph Ebner, Chairman, receiving gavel; and Arthur Gudert, First Vice-Chairman

Sees Tooling as Most Logical Means to Lower Prices

Newark, N. J.—Since our economy cannot continue on the present inflationary basis, improvements in tooling are the healthiest means of lowering prices, Roy T. Hurley of the Executive Staff of Production, Ford Motor Co., Dearborn, Mich., told an audience of 300 attending Northern New Jersey Chapter's Executives Night, March 9, in the Robert Treat Hotel.

Mr. Hurley, until recently Vice-President in Charge of Manufacturing for the Bendix Aviation Corp., Detroit, apportioned direct cost of manufacturing at approximately 15%, leaving about 85% as indirect cost of manufacturing. By working in the sphere of the larger percentage, he said, the tool engineer finds his opportunity to contribute his knowledge and ingenuity toward decreasing the cost of the finished product.

Higher speeds and feeds, in the speaker's opinion, contribute considerably toward cutting manufacturing costs, but the surface has only been scratched. With materials ranging from carbon steel to diamonds, the engineer is unlimited in his selection of cutting tools to achieve ultimate speeds.

Mr. Hurley was enthusiastic about carbide and believes that the application of this metal is only in its infancy. He recommended careful study of shank and design of backing material, in conjunction with carbide. Fixtures must be given special consideration and new methods of holding that will afford speedier handling are essential to minimize floor to floor time.

Otto W. Winter, long-time Chairman of the ASTE National Education Committee, described the Society's activities in promoting formal education in tool engineering.

T. J. Donovan, Jr., ASTE National Director, officiated at the installation of Chapter officers, administering the oath to: C. B. Carlson, Chairman; C. E. Kennedy, First Vice-Chairman; William Wheaton, Second Vice-Chairman; H. W. Ryno, Secretary; and A. J. Schmidt, Treasurer.

Mr. Donovan spoke on the Cleveland tool exposition, giving a brief verbal preview of some exceptional exhibits. Stressing the importance of building Society membership, he offered his personal check for $50 to be awarded the first Chapter member introducing 15 new members.

Top: Officers of Northern New Jersey Chapter were installed before an Executives Night audience of 300. From left: H. W. Ryno, Secretary; A. J. Schmidt, Treasurer; William Wheaton, Second Vice-Chairman; C. B. Carlson, Chairman; T. J. Donovan, Jr., National Director and installing officer; C. E. Kennedy, First Vice-Chairman; and John Webster, Past Chairman. Below: Twin City Chapter introduces its new official family. From left, seated: K. K. Roby, Alternate; R. W. Hawkinson, Second Vice-Chairman; P. S. Tobias, Treasurer; H. D. Sullivan, Chairman; R. L. Martin, First Vice-Chairman; L. C. Blanchar, Secretary; and W. E. Boker, Delegate. Standing: E. J. Lyons, Industrial Relations Chairman; D. A. Coacher, Education; C. G. Adams, Constitution and By-Laws; A. J. Bielski, Public Relations; W. F. Sahlin, Entertainment; Glen Roberts, Membership; and Clifford Lofdahl, retiring Chairman

Claims Quality Control Excels Full Inspection

Minneapolis, Minn.—"Statistical Analysis of Quality Control" was the subject presented to Twin Cities Chapter by Stanley C. Amren, Assistant Chief Inspector of Quality Control, Minneapolis-Honeywell Regulator Co.

With graphs and charts, Mr. Amren demonstrated the superiority of this method of quality control over a 100 percent sampling of the product, since the statistical method can predict bad or scrap parts before they are actually produced. He explained how the accuracy of the entire run can be ascertained by inspecting only 190 samples from a lot of 100,000 pieces.

At this meeting, officers for the 1948-49 term were installed. Glen Roberts administered the oath to: H. D. Sullivan, Chairman; R. L. Martin, First Vice-Chairman; R. W. Hawkinson, Second Vice-Chairman; P. S. Tobias, Treasurer; L. C. Blanchar, Secretary; W. E. Boker, Delegate; and K. K. Roby, Alternate.

Committee chairmen appointed by Mr. Sullivan are: E. J. Lyons, Industrial Relations; D. A. Coacher, Education; C. G. Adams, Constitution and By-Laws; A. J. Bielski, Public Relations; W. F. Sahlin, Entertainment; Glen Roberts, Membership; and R. L. Martin, Program.

Sanborn Gives Gear Talk

Milwaukee, Wis.—George H. Sanborn, Chief Field Engineer for The Fellows Gear Shaper Co., Springfield, Vt., was the principal speaker at a meeting of Milwaukee Chapter, March 11, in the Elks Club.

Mr. Sanborn's lecture, "The Art of Generating and Gear Manufacturing Equipment," was augmented by two sound films on the same subject and a question and answer period.

A. E. Rylander, Technical Editor of *The Tool Engineer*, spoke briefly before the technical session.

The following officers for the ensuing year were sworn in: Chairman, Joseph Ebner; First Vice-Chairman, Arthur Gudert; Second Vice-Chairman, Herbert Heimann; Secretary, Walter Behrend; and Treasurer, Walter Klein.

Chairman Ebner received the Chapter charter, gavel and Chairman pin from his predecessor, Paul Butzin.

Mr. Ebner then introduced the new officers and the technical speaker.

A sports film, "Fishing off the Coast of Florida," was shown at the conclusion of the formal program.

Paper Making Equipment Amazes Guest Engineers

St. Catharines, Ont.—Niagara District Tool Engineers were guests of the Ontario Paper Co. in Thorold, March 3. Under the direction of Mr. Raye, Master Mechanic, and a few employee guides, some 65 members and friends were taken on a highly interesting trip through the mill.

The group was astonished at the vast equipment necessary for high scale production in the paper industry, the endless length of conveyors used in processing pulp throughout the plant, the tanks and storage chests.

Newsprint is run off the paper-making machines at the rate of approximately 1,125 feet per minute, or a total of some 535 tons a day. The Ontario mill supplies newsprint for the *Chicago Tribune*, in addition to large quantities of bulk stock to tissue paper plants in the area.

Alcohol, the main by-product, supplied to manufacturers of perfumes and anti-freeze, is produced in a separate building containing numerous tanks and miles of piping. The plant is under government control at all times.

Following the tour, a buffet supper was served in the cafeteria, and the remainder of the meeting was devoted to installation of the new officers. W. L. Sandham, retiring Chairman, expressed his appreciation for the fine co-operation given him throughout his term, and urged all members to support the incoming executives.

Henry Hendricks, Past Chairman, swore in the following officers: Harry Gorth, Chairman, and Ernest Morley, Second Vice-Chairman, both of Lightning Fastener Co.; Norman Coleman, First Vice-Chairman, of McKinnon Industries, Ltd.; Cyril Mitchell, Secretary, of Imperial Iron Corp.; and Robert Watts, Treasurer, of Thompson Products Co.

New California Legislation Gives T. E. Recognition

Los Angeles, Calif.—"The Civil Engineers Act and What It Means to You" was discussed by Hans Bamberger, Chief Engineer of Atlas Industrial Engineering Co., before a meeting of Los Angeles Chapter, March 11. Mr. Bamberger is also Chairman of the Chapter Education and Training Committee.

Under this new California statute, said Mr. Bamberger, a tool engineer can be registered in the "Mechanical Engineers" classification. The new law will give professional recognition to a group playing an important engineering role in industrial production.

Mr. Bamberger cited other professional groups as examples in his admonition to raise the ethics of Professional Engineers. A brief question and answer period followed, concerning details of the new law. Louis Biehler, original Chairman of the Chapter, officiated at the installation of new officers.

Problems encountered in manufacturing magnesium armor for the filming of "Joan of Arc" were related by Paul Burt, Chief Engineer of Arrowsmith Tool & Die Co.

Components of 100 suits of armor were formed on drop hammers and trimmed on band saws. Magnesium sheet was heated to 600°F, and the dies pre-heated. The entire operation had to be completed within 5 seconds to avoid breakage through chilling of the stock.

Concluding the program was a motion picture made at the Houston convention by A. M. Sargent, a Past President of the Society.

Rylander Addresses Installation Meeting

Oshkosh, Wis.—A. E. Rylander, Technical Editor of *The Tool Engineer*, addressed Fond du Lac Chapter's installation meeting, March 12, at the Athearn Hotel, Oshkosh. His subject, "Progress Through Free Enterprise," concerned the importance of the American way of life and its value as compared to systems in effect elsewhere.

W. E. Rutz, the outgoing Chairman, presided and introduced the speaker.

K. F. Gallimore, first Chairman of the Fond du Lac group, installed the new officers. They are: J. P. Schommer, Chairman; N. R. Boynton, First Vice-Chairman; W. H. Jorgensen, Second Vice-Chairman; P. V. Rohling, Secretary; and R. M. Woytych, Treasurer.

After receiving a Past Chairman pin from Mr. Gallimore, Mr. Rutz presented Mr. Schommer with the Chairman emblem.

Among the audience of approximately 100 were members from Green Bay, Kaukauna, Appleton, Neenah-Menasha, Manitowoc, Oshkosh, Fond du Lac, Sheboygan, Ripon, New Holstein, Brillion, Clintonville, Oakfield, West Bend, and guests from Milwaukee.

Top: This alert group will handle affairs of Niagara District Chapter for coming year. From left: Robert Watts, Treasurer; Ernest Morley, Second Vice-Chairman; Harry Gorth, Chairman; Norman Coleman, First Vice-Chairman; and Cyril Mitchell, Secretary. Below: A. E. Rylander, Technical Editor of *The Tool Engineer*, tells Fond du Lac Chapter of "Progress Through Free Enterprise." At left: George Tegen and W. E. Rutz, retiring First Vice-Chairman and Chairman, respectively; and right, J. P. Schommer, incumbent Chapter Chairman, who was sworn into office

Gearing Program Feature At Installation Night

Rochester, N. Y.—Approximately 125 members battled the greatest snow storm of the season to attend Rochester Chapter's installation ceremonies and gearing symposium held March 2 at the American Legion Doud Post.

Milton Roessel, retiring Chairman, administered the oath of office to: H. O. Simon, Chairman; W. R. Gordon, First Vice-Chairman; J. R. Horne, Jr., Third Vice-Chairman; F. E. Bittner, Treasurer, and R. T. Barnett, Secretary. E. W. Moore, Second Vice-Chairman-elect, was not present.

After receiving the Chapter Chairman pin from Mr. Roessel, Chairman Simon presented the speakers of the evening, Louis D. Martin, Gear Engineer, Eastman Kodak Co., and Philip G. Fishback, Quality Control Engineer, Graflex, Inc.

Mr. Martin, a gearing authority, discussed "Manufacturing of Fine Pitch Gearing." While this phase of gearing did not have much significance before the war, it is now in a field by itself, said Mr. Martin, who quoted the American Gear Manufacturers Association definition as "gearing of a finer pitch than 20 diametral."

Highlighting the lecture were slides and colored motion pictures showing the various stages and types of gear cutting and the necessary machines. The film was shown through the courtesy of The Fellows Gear Shaper Co.

"Inspection Methods for Fine Pitch Gearing," as described by Mr. Fishback, dealt with problems encountered and their solutions. A Chapter member, the speaker has contributed articles to *The Tool Engineer*.

At the conclusion of the technical session, a delicious buffet lunch was served and the group was entertained with music reproduced by the Chapter's new recording unit. The machine will be used for recording executive meetings and technical sessions.

Metal Cutting Factors Detailed by Schmidt

Erie, Pa.—Dr. A. O. Schmidt, Research Engineer for Kearney & Trecker Corp., West Allis, Wis., addressed Erie Chapter, March 2, at a meeting in the General Electric Community Center.

A. O. Schmidt

His discussion of basic factors in metal cutting included chip and workpiece temperatures, tool wear, influence of rake angles on power consumption in high-speed milling, and successful application of laboratory findings to production problems. A lengthy question and answer period followed.

The technical session was preceded by a social hour, dinner, and business meeting. Chairman Mathew H. Hetzel called on W. B. Peirce, retiring President, to install the incoming officers. Sixty-two members and guests were present.

Top: Outstanding social event at Mid-Hudson Chapter was recent Ladies' Night. Shown, committee in charge, from left: Donald Winslow, John L. Petz, Chapter Chairman; J. L. Hillis, Joseph Crane, Frederick Neumann, Ladies' Night Chairman; L. H. Tenney, J. H. Keller, and Joseph L. Petz. Below: Members and guests enjoy buffet supper

Ordinary Mechanic Can Measure Millionths of Inch

Poughkeepsie, N. Y.—By separating blended light into individual waves of definite lengths, in connection with interference-creating instruments, measurements of extreme accuracy can be attained, Adam Gabriel, Vice-President of the Acme Industrial Co., Chicago, Ill., explained while lecturing March 9 before approximately 75 members and guests of Mid-Hudson Chapter.

Mr. Gabriel described in detail the theory of the optical flat used as the interfering instrument. Having two functions, it first divides a light ray into two wave trains, each having the same wave length as the original ray; and second, provides an exceedingly flat reference surface.

In practice the flat is placed on the piece to be measured. Light, penetrating to the lower polished surface of the flat, is divided into two rays, one reflected directly to the eye, the other continuing on downward and striking the surface of the work before reflecting.

Since both rays have the same wave length, they either reinforce each other to produce brightness or interfere and produce an effect of darkness, depending upon the spacing between the optical flat and the surface of the work. This light or darkness takes the form of alternating parallel, circular or odd patterned bands, called interference bands.

A bright band is produced at every point where the distance between the flat and the work is any multiple of 11.6 millionths of an inch when viewed with a helium monochromatic light source. The dark bands lie midway between. Thus the difference in height between two points on the work surface is equal to number of bands between the points multiplied by 11.6 millionths of an inch.

With this method, measurements to hundred-thousandths and millionths of an inch are made by the average mechanic as easily as measuring tenths with a micrometer.

The speaker stressed the importance of sending master gage block sets to the Bureau of Standards for frequent measuring with an interferometer. This instrument actually measures the length of the block directly in wave lengths of light, without reference to any other standard, this being the only absolute method of measurement.

Great care must be maintained in producing optical flats in order to obtain a highly polished and flat surface. In developing optical flats, Mr. Gabriel stated, a method of polishing was devised adaptable to any shape surface. Such a technique lends itself particularly to mold surfaces, where the product is no better than the surface of the mold itself.

Coffee speaker was Herbert J. Thomsen, Education Editor of the *Poughkeepsie New Yorker*, who discussed "Precision in the Newspaper Business."

* * *

A ladies night program held the previous month at the Poughkeepsie Tennis Club was enjoyed by 65 couples. Dancing, professional entertainment and a buffet supper combined to make a pleasant evening.

Lou, Ferguson Plant Mgr.

Detroit, Mich.—Nils Lou, until recently Production Manager at Thew Shovel Co., Lorraine, Ohio, has been appointed Tractor Plant Manager of Harry Ferguson, Inc., Horace D'Angelo, Executive Vice-President, has announced.

Mr. Lou will be in charge of all plant operations, including plant layout, tooling and planning production.

A former Factory Manager for the Glenn L. Martin Co. of Baltimore, Md., he has served as Chairman of the ASTE Chapter in that city and as a National Director of the Society.

Top: Retiring Chairman P. H. Magnus (left) administers oath of office to Pittsburgh Chapter executives for 1948-49. Officers, from left: W. S. Risser, Chm.; F. T. Boyd, 1st V.-Chm.; G. C. Wood, 2nd V.-Chm.; H. L. Harper, Secy.; and W. J. Bickmore, Treas. Below: Greater New York members chat with their guests at recent reception for non-members

Deep Drawing Problems Explained by Expert

San Francisco, Calif.—Charles Robie, President, Gilro Machine and Stamping Co., Oakland, addressed Golden Gate Chapter, March 16, on the subject, "Deep Drawing." Mr. Robie's outstanding reputation in the Bay area drew an attendance of more than 100.

Introductory portion of the lecture included a resume of the art of forming and drawing sheet metals, and a description of types of presses used. Then followed a series of important factors of metal drawing, i. e.: the function of punch, die and blank holder ring; applications for single, double and triple action presses; how to draw rectangular shapes; and how to avoid wrinkles in tapered shapes.

Quality control of stock being formed, annealing methods used when forming low carbon sheet, and stainless materials concluded the talk.

Many samples of drawn shapes were exhibited and problems encountered in their manufacture were explained by the speaker in the ensuing open discussion. Mr. Robie's personal contact with every problem made this feature of the program highly interesting.

The technical presentation was prefaced with a fine sound film furnished by the International Nickel Co.

Rennell Advanced

Toledo, Ohio—Lorence E. Rennell, a charter member and former Chairman of Toledo Chapter, has been promoted to Chief Methods Engineer of the National Supply Co., where he has been serving as Tool Supervisor.

Previous associations include Spicer Mfg. Co., Bendix Aviation Corp., and American Propeller Corp.

Bouton Installs Officers Roberts Talks on H.S.S.

Racine, Wis.—March 8 dinner meeting of Racine Chapter held in Dania Hall featured installation of new officers by Eugene Bouton and a technical session conducted by Dr. George A. Roberts, Chief Metallurgist of Vanadium-Alloy Steel Co.

Mr. Bouton, one of the founders of the Chapter, reminisced on its early days, before inducting: William Reinhardt, Jr., Chairman; Charles Moran, First Vice-Chairman; Edwin B. Christianson, Second Vice-Chairman; Robert L. Schultz, Secretary; and George F. Tigges, Treasurer.

Dr. Roberts gave a very enlightening lecture on high speed steels, their selection and heat treatment. Curves and microscopic pictures of steels during heating and addition of alloys illustrated the address. A lively discussion was carried on after the talk.

Non-Member Guests Hear Thread Rolling Lecture

New York City—An outstanding presentation on "Precision Thread Rolling Techniques" was delivered March 8 by A. Bradford Reed, President, Rolled Thread Die Co., Worcester, Mass., before approximately 250 members and guests of Greater New York Chapter. The occasion, Non-Members Night, was the highlight of the season.

Advantages, limitations, materials employed, rates of production and other practical aspects of thread rolling were thoroughly discussed by Mr. Reed. Slides, case histories, and typical parts served as illustrations.

Members of the Executive Committee acquainted the visitors with the functions and aims of the Society.

Color Found Effective As Production Tool

Pittsburgh, Pa.—Color dynamics can be utilized to promote efficiency in industry, Richard P. Bell, Color Consultant, Pittsburgh Plate Glass Co., told some 80 members and guests attending the March 5 meeting of Pittsburgh Chapter.

Early research revealed, said Mr. Bell, that red colors grow dim and blue and green more pronounced when the ears are exposed to loud noises, with strong odors producing the same effect. And by subjecting a person to a given color for five minutes, varying effects upon physical activities, memory and mental work can be detected.

Wave Lengths Can Be Utilized

These and other findings substantiated the proposition that every color, as a member of the visible light spectrum, has a different wave length that can be harnessed for practical use. The sensation of color is produced by the action of the visible waves, traveling at a rate of 186,000 miles per second, upon the eye as they reflect from an object or surface.

Thus, surfaces on which the eye rests should be of shades that do not produce irritation and constitute a mental and physical menace.

Although white reflects the most light, it has a discouraging bleakness if unrelieved by warm and cheerful colors. It may cause eye-injuring glare and actually reduce visibility if the work area is relatively dim.

Practical industrial applications of color, the speaker emphasized, increase quantity and quality of production, reduce accidents, cut absenteeism, and boost morale.

Can Create Illusions

Color can be used to: identify materials and equipment, improve decorative scheme, minimize effect of weight or bulk, alter apparent physical proportions of an area or visually eliminate an undesirable structural feature, change apparent temperature, induce orderliness and cleanliness, reduce body fatigue, eliminate safety hazards, and cut illumination costs.

Most effective color combinations were cited and a series of panels demonstrated the points discussed.

Mr. Bell was assisted by G. D. Corbett, also of Pittsburgh Plate Glass Co.

Officers Inducted

Retiring Chairman Paul H. Magnus administered the oath of office to: W. S. Risser, Chairman; F. T. Boyd, First Vice-Chairman; G. C. Wood, Second Vice-Chairman; W. J. Bickmore, Treasurer; and H. L. Harper, Secretary.

W. B. Peirce, retiring Society President, spoke briefly to the new officers concerning their duties and responsibilities.

Chairman Risser presented a Past Chairman pin to Mr. Magnus who also received a traveling bag from Past Chairman W. S. Schott, on behalf of the Chapter.

Realism Needed to Meet ERP-Fostered Competition

Toledo, Ohio—In order to maintain our industrial leadership in the face of foreign competition fostered by the Marshall plan, we must be realistic and rid ourselves of such fallacies as: 1. Other peoples do not have mechanical ability—disproved by Japanese achievements before the last war.

2. We will always retain our leadership in the quality of our goods—workers must utilize their machines to the fullest extent and do an honest day's labor of better quality; and 3. Due to recent developments, our industrial system may not be needed in another war.

This point was stressed by Burnham Finney, Editor of *American Machinist*, in an address, "One World Mechanized," March 10, before 200 members and guests of Toledo Chapter.

ERP, the acme of all "year plans" now in progress, said Mr. Finney, aims by 1952 to increase steel ingot production in Western Europe to 61 million tons annually; coal mining to 600 million tons; oil refining to two and one-half times prewar; and farm and mining machinery manufacture accordingly.

Alerted in the last war to the need of machine tools, Sweden, Italy, France and Australia are building up their industry in this direction. Russia, now in its fourth five-year plan, claims it will be able to build 75,000 machine tools, 400,000 motor trucks, 100,000 farm tractors, besides manufacturing 250 million pairs of shoes, by 1950. It is also working toward comparative figures in coal mining and steel production.

India is gradually mechanizing its industries, with 95% of its textiles and 75% of all other industry owned by natives. Argentina, too, is developing its metal working business.

America, Mr. Finney believes, should accept the challenge without misgivings. It has the resources and skills to maintain its position, and opportunity to service the increased demand for goods by foreign consumers, coincident with the development of these countries.

H. L. Tigges, National Director, installed the following Chapter officers for 1948-49: L. F. Rothert, Chairman; R. H. Mogle, First Vice-Chairman; R. C. Peterson, Second Vice-Chairman; C. W. Anderson, Secretary; A. G. Gable, Treasurer; Richard Hindman, Delegate; and Albert Hage, Alternate.

Mr. Hage, the retiring Chairman, summarized the year's activities.

Daniel O'Brien, President of the Toledo Chamber of Commerce, in the role of toastmaster, introduced honor guests: A. L. Baker, Pres. and Gen. Mgr., Baker Bros., Inc.; E. W. Donkel, Vice-Pres. and Gen. Mgr., Kent-Owens Machine Co.; William Delger, Gen. Mgr., The De Vilbiss Co.; P. G. Weatherby, District Mgr., McGraw-Hill Publishing Co.; and J. M. Cannon, ASTE Director of Public Relations.

Industry Should Recruit Vocational Students

Elmira, N. Y.—Man's educational needs, from prehistoric days to the present tool engineer's requirements, were outlined by Varner T. MacRorie, Instructor of Machine Shop Practice and Related Technical Subjects, Southside High School, speaking before Elmira Chapter, April 5.

Standardization of design, mechanical shorthand, recent developments in tools and machines, and present values in high school vocational training of boys were treated at length by Mr. MacRorie.

Industry, he feels, should absorb more of these boys, instead of permitting them to drift into mediocre manual jobs at the end of their school training.

Plans were made for a tool designing contest among Elmira high school students. Harry W. Rice, Contest Chairman, announced that a set of drafting instruments and a set of jig and fixture design books would be awarded as prizes.

Chester Wilson, local industrial patent engineer, gave a coffee talk concerning patents and patent procedure.

Frank W. Curtis, ASTE Past President, now National Editorial Chairman, swears in officers of Fairfield County Chapter. From left: T. E. Horgan, Second Vice-Chairman; W. C. McDonough, Chairman; M. W. Wilterdink, First Vice-Chairman; D. F. Linsley, Secretary; and Mr. Curtis, who also gave technical address on tool designing

Researchers Compare Cutting Methods

Philadelphia, Pa.—More than 250 Philadelphia Tool Engineers crowded into the Engineers Club to attend a chilling symposium presented recently by Hans Ernst, Research Director, Cincinnati Milling Machine Co., and A. O. Schmidt, Research Engineer, Kearney & Trecker Corp.

A planned program supervised by specialists, rigid mounting of work, correct tool geometry, and angle of engagement were named by Mr. Ernst as important factors in the application of carbide milling. These points were illustrated with a film.

The complexity of chip removal by cutting tools is receiving increasing attention in both industrial and university research laboratories, he stated. As with all other physical processes, metal cutting must be subjected to mathematical analysis—must move from art to science—if it is to be developed to its fullest potentialities. Cost of machining metal parts will thus be reduced to the lowest possible level.

From Mr. Schmidt's experience the solution of metal cutting problems does not always lie in the adoption of sintered carbide as the cutting tool. If proper attention is given to the design and preparation of high speed and cast alloy steel cutters, improved results will be attained, in some cases even more economically than through the use of carbide tipped tools.

Slides showing measurement of high speed milling illustrated much of his talk concerning "Basic Factors in Metal Cutting."

E. R. Roth of the Engineers Club spoke briefly concerning the Franklin Institute Engineering Progress Show, May 11-16.

Emil Kitzman, Second Vice-Chairman, and Roy Paulson, Membership Chairman, discussed the Chapter membership drive.

Reviews Design Principles

Bridgeport, Conn.—Technical program at the March 3 dinner meeting of Fairfield County Chapter was presented by Frank W. Curtis, Consulting Engineer, Induction Heating Corp., New York City, and a former ASTE President.

His subject, "Basic Principles of Tool Design," reviewing time proven tooling fundamentals, was augmented with slides.

During the business session prior to the lecture, Mr. Curtis installed the incoming officers. They are: W. C. McDonough, Chairman; M. W. Wilterdink, First Vice-Chairman; T. E. Horgan, Second Vice-Chairman; D. F. Linsley, Secretary; and T. J. Keating, Treasurer.

Winfrey, Reltool Agent

Boston, Mass.—Walter E. Winfrey Co. of Cambridge has been appointed sales representative, in Eastern Massachusetts, Rhode Island, New Hampshire and Maine, for Reltool Corp., Milwaukee, Wis.

The organization is headed by Walter E. Winfrey, a Boston ASTE member.

National Secretary Inducts Hamilton Officers

W. E. Dawson (left), retiring National Secretary, reads oath of office to incoming heads of Hamilton Chapter. Officers, from left: R. T. Vincent, Treasurer; W. S. Werthmiller, Secretary; Gordon Hall, Chairman; G. Gilmour, First Vice-Chairman; W. Patterson, Second Vice-Chairman; and H. Coit, Third Vice-Chairman of this Canadian group.

Welding Electrodes Simplify Tool and Die Processing

Montreal, Que.—"Production delays can be minimized, manhours saved and material conserved by proper use of tool steel welding electrodes," said P. S. Doyen, Field Engineer, Welding Equipment and Supply Co., Detroit, Mich., during his talk, "The Story of Reclamation and Composite Fabrication of Tools and Dies," at the March 11 meeting of Montreal Chapter.

Describing the development of tool steel welding, the speaker pointed out that there are several hundred types of tool steel on the market.

Manufacturers of welding electrodes found it impossible to produce specific rods for each type; but investigation showed that the various brands could be classified as oil hardening, air hardening, water hardening and high-speed tool steels, and cast alloys, according to their heat treatment characteristics.

Their problem thus simplified, the manufacturers developed electrodes for welding the five basic types, producing a specific grade of welding rod for each.

After explaining the factors involved in the successful use of these electrodes, Mr. Doyen outlined a complete procedure.

Eliminates Annealing, Heat Treat

Using these precautions, he continued, all kinds of tools and dies can be repaired, fabricated or reclaimed by the use of tool steel electrodes. No annealing is necessary in the case of hardened steels, nor further heat treatment after welding, since the deposit will invariably be harder than the original metal.

Two films, "Let's Get the Low-Down" and "Let's Do It Right," illustrated practical applications of the method and clarified procedure for using this economical means of simplifying construction and repair of tools and dies.

G. A. Rogers thanked the speaker after the audience had expressed its keen interest by asking numerous questions at the end of the talk.

R. B. Douglas, First Vice-President, performed the ceremony of swearing in the new officers and, on behalf of the Chapter, congratulated Henry Welch, retiring Chairman, on his splendid handling of Chapter affairs.

The officers installed are: Chairman, G. S. Clarke; First Vice-Chairman, A. M. Rice; Second Vice-Chairman, M. A. Cote; Third Vice-Chairman, Sam Pedvis; Secretary, M. J. Baker; and Treasurer, C. J. McDowell.

Chairman Clarke announced the following committee appointments: Membership, John MacDonald; Editorial, A. M. Rice; Constitution and By-Laws, W. F. Stewart; Standards, G. Clark; Public Relations, J. P. Harkness; Education and Training, J. R. Houghton; Entertainment, A. B. Chevrier; and Program, C. A. Gareau.

Public Relations Aspects

Eric Crawford, of the National Public Relations Committee, stressed the importance of public relations to the success of the Society. He impressed upon the members the part that each should play in making the general public conscious of the aims and aspirations of ASTE, and the tool engineer's importance in our modern civilization.

George Clarke regretfully announced the death of Hans Schlieper, well-known Chapter member. Mr. Schlieper, who was Production Manager at Metal Craft Ltd., was fatally injured in a fall down an elevator shaft at his plant recently.

* * *

H. E. Conrad, ASTE Executive Secretary, paid a short visit to Montreal recently and attended a Chapter executive meeting. His resume of the Society's activities gave an insight to the enormous amount of work behind the operation of the Society.

Jet Engine Tooling Talk 10th Birthday Feature

Philadelphia, Pa.—Complex tooling problems experienced by Westinghouse Electric Corp. in the development and manufacture of jet engines for the Navy, were related by Samuel S. Stine, Manager of Manufacturing in the company's Aviation Gas Turbine Div., as the technical feature at Philadelphia Chapter's recent Tenth Anniversary Night.

Due to the difficulty of repeating dimensions of castings, forgings and weldments, the group learned, high production tooling of the sturdy, fixed-locating type has not proven satisfactory. But the same design principle, using adjustable locating points, has been very successful.

Resistance Welding Preferred

Most difficult sub-assembly to manufacture, according to Mr. Stine, is the combustion chamber fabricated structure. Forgings machined to ⅛" thickness are assembled and welded to sheet metal struts .030" to .049" thick. Jigs are necessary to maintain required accuracy of cross-sectional area of air flow.

In the assembly of the jet engine, arc, heli-arc, and resistance welding are used, the latter preferred where possible because it produces less distortion.

Mr. Stine's lecture was freely illustrated with slides showing cross-sections and cut-away, three-dimensional views of assemblies. In addition actual detail parts and sub-assemblies were displayed.

The speaker also summarized the operation of the engine and showed a Technicolor sound film of the first all-jet airplane landings on a U. S. Navy Carrier.

C. O. Hersam, first Chairman, and P. W. Frankfurter, Sr., another former Chapter head, spoke briefly, reminiscing on the original meeting and early financial problems of the group. Other Chapter founders present were: H. W. Gross, J. A. Strecker, F. M. Crayton, J. A. McMonagle, T. J. Donovan, Jr., Charles Crook, Jr., and W. L. Battersby.

Mr. Donovan, a National Director, supervised the cutting of a tenth birthday cake. Approximately 175 members attended the anniversary observance.

Top: Former Chairmen of Philadelphia Chapter were honor guests at recent Tenth Anniversary celebration. From left: C. O. Hersam, P. W. Frankfurter, Sr., J. A. McMonagle, Charles Crook, F. M. Crayton, T. J. Donovan, Jr., J. W. Noble, and A. R. Diamond. H. W. Gross and J. A. Strecker were absent. Below: Incoming officers of Montreal Chapter repeat oath of office after R. B. Douglas (left), ASTE Vice-President. Officers, from left: M. J. Baker, Secy.; G. S. Clarke, Chm.; A. M. Rice, 1st V.-Chm.; M. A. Cote, 2nd V.-Chm.; and C. J. McDowell, Treas.

Principals of Fox River Valley Installation Night

March dinner meeting of Fox River Valley Chapter at St. Charles, Ill., was highlighted by installation of officers. A "smoker" and cards followed. Shown from left: Roy Frogness, retiring Chairman; R. F. Waindle, Chairman; W. B. Hamlin, Secretary; B. Phillips, 1st Vice-Chairman; C. E. Alltop, 2nd Vice-Chairman; and G. Bodi, Treasurer

Coming Meetings

BOSTON—June 12, Annual Outing, Marlboro Country Club, Marlboro, Mass. Golf, athletic events, refreshments, prizes, banquet and entertainment.

CHICAGO—May 26, Annual Spring Dance.

CLEVELAND—May 14, East Side Turners. Speaker: B. F. Bregi, Executive Engineer, National Broach and Machine Co. Subject: "Modern Methods of Gear Manufacture."

HAMILTON—May 14, Ladies Night, Fischer Hotel. Program and film sponsored by "Frigidaire."

HARTFORD—June 7. Hartford Nite, program to be announced.

LOS ANGELES—October 11, 12, 13. ASTE 16th Semi-Annual Meeting.

MILWAUKEE—May 13. Plant tour, dinner and business meeting at Falk Corp.

PITTSBURGH—June 11, Annual Picnic, Paradise Gardens (formerly Daniels Farms), North Side Pittsburgh. Sports, refreshments, dinner. Guests welcome.

TOLEDO—May 12, 7:00 P.M., Toledo Yacht Club. Speaker from The Lapointe Machine Tool Co. Subject to be announced. June 9, Outing, Highland Meadows Gold Club, Sylvania, Ohio. Golf tournament 1:00 P.M. until dark, dinner and entertainment.

Place on ASA Committee

Toledo, Ohio—Reuben M. Place, Toledo Chapter member and President of Toledo Bearing Co., was appointed ASTE Representative on the ASA Sectional Committee, B3, Ball and Roller Bearings, at a recent meeting of the ASTE National Standards Committee.

Open Discussion Centers On Self-Oiling Bearings

Louisville, Ky.—Members of Louisville Chapter learned about Powder Metallurgy from A. J. Langhammer, President, Amplex Mfg. Co., Div. of Chrysler Corp., who addressed them at a dinner meeting March 10.

Processing of the alloys through the sintering and tooling of finished parts was fully described. Engineering obstacles encountered and overcome were shown in slides.

A discussion on applications of bronze and iron, oil impregnated bearings drew numerous queries from the audience.

Douglas Martin, George and Leon Desautels assisted Mr. Langhammer.

Officers installed for the 1948-49 term are: J. A. Black, Chairman; N. H. Booker, First Vice-Chairman; G. A. Egan, Second Vice-Chairman; L. G. Gutermuth, Secretary; and W. D. Wuest, Treasurer.

ASTE'ers in New Setup

Detroit, Mich.—Several ASTE members are affected by the new marketing organization set up by Carboloy Co., Inc.

K. R. Beardslee, formerly Vice-President in Charge of Sales, has become Vice-President and Marketing Manager; J. E. Weldy has been named Sales Manager; and J. M. Bertotti is Manager of Training. Mr. Weldy was formerly Manager of Distributor Sales, while Mr. Bertotti was Director of Sales Training.

Harry Crump is Manager of Cutting Tool Sales-Engineering, and A. F. Dobbrodt of Pittsburgh is Special Products Sales Engineer.

Evansville Members Listen to Electronics Lecture

K. L. Burrell, Control Specialist of General Electric Co., delivered a lecture on "Industrial Electronics," accompanied by slides at March 8 meeting of Evansville Chapter, held in Evansville College. Mr. Burrell's talk was preceded by dinner in the College Cafeteria. Installation of the 1948-49 officers also took place during this meeting

Designer Should Solve Die Problems, Says Cope

South Bend, Ind.—More than a hundred members and guests of South Bend Chapter heard Stanley R. Cope, President of Acme School of Die Design Engineering, and A. E. Glen, Manager of Die Sales, Carboloy Co., Detroit, Mich., lecture on Dies at a meeting, March 9, in the Indiana Club.

Mr. Cope addressed the engineers on the subject of "Deep, Medium and Shallow Die Drawing." Tryout time for die building, he stated, should not represent more than 10% of the die cost, but in most cases lack of experience often runs the tryout much higher.

With slides and formulas the speaker demonstrated that any die problem could be solved by the designer, thereby reducing cost and tryout time. As mistakes in design are very expensive, industry needs more designers capable of using proper formulas.

"Application of Carboloy in the Die Field" was presented by Mr. Glen, who reviewed the introduction of Carboloy dies in the wire drawing industry where they replaced more expensive diamonds and other hard stones. Later they were used in the cold drawn steel industry to form steel bars, and in the past year they have been employed for notching and blanking dies.

Although costing about five times as much, Carboloy dies are credited with 20 times the life of an ordinary steel die. Slides illustrated many new applications.

Machine Tools Create Employment, Markets

Williamsport, Pa.—Far from decreasing the number of jobs available, machine tools actually create new employment, H. E. Linsley, Associate Editor of *American Machinist*, declared in an address, "The Machine Tool and You," given March 8 before a meeting of Williamsport Chapter members and guests.

H. E. Linsley

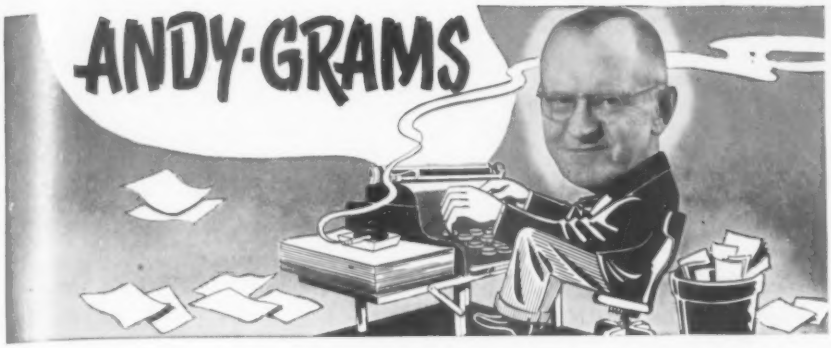
By way of illustration, Mr. Linsley cited the washing machine industry. In 1920 when 5000 people were engaged in this field, average cost of a unit was $175. With employment increased to 7000 in 1930, the price dropped to $100. Though wages and material costs had risen appreciably by 1940, the industry's 10,000 workers produced enough so that electric washers still could be marketed at the $100 figure.

Use of machine tools, concluded Mr. Linsley, reduces product price, which in turn stimulates demand and production.

Another speaker, Albert E. Conklin, Personnel and Technical Director for C. A. Reed & Co., described the manufacture of crepe paper and related products.

Incoming officers installed by J. H. Shafer are: D. M. Lowrey, Chairman; E. H. Sears, First Vice-Chairman; R. S. Huskin, Secretary; and Morris Smith, Treasurer.

ANDY-GRAMS



Well, I've been away again, this time to the 12th Annual Machine Tool Electrification Forum sponsored by Westinghouse Electric Corp'n and held at the Statler Hotel, Buffalo. Entraining at Detroit and settling down for some relaxation with one of Ted Shane's "cockeyed" crossword puzzles—and are they screwy!—before turning in, I found myself being kabitzed by a guy across the aisle who turned out to be Larry Leifer from Madison Chapter.

Just then Earnest Seborg popped in, but from where I was sitting he looked like a 6-footer so I didn't place him until he took his hat off. Also, in the group, was Farrel Weber of Micromatic Hone, and Doug Peden, so we had a right entertaining evening between X-words and a gabfest before hitting the hay. Then up betimes to see Niagara Falls—incidentally, my first view of the gorge from the Canadian side.

Breakfast at the hotel, then to the Forum where, mingling around between sessions, I ran across ASTEers George Keller of Geo. Keller Mach. Co., Stan Brandenburg and Kermit Kuck of Monarch Machine Tool—both of whom have been stepped up to vice prex—Ray Woytech, of Giddings & Lewis, with whom I spent a pleasant evening, and Harry Pelphrey of Michigan Tool whose name I got scrambled a/c my unique memory system. Y'see, if a guy's name is Dunn I think of a color which is okay if his name isn't Brown or Green. In case you're wondering about the connection a palfrey is a horse, and so is a Norwegian dun. No wonder my system gets mixed up now and then, like Steel, Iron or Flint for something hard.

Through Earnest Seborg, met Barnes Drill Company's prex Walt (Scotty) Fairbairn—I almost wrote Fairchild although it takes a Gael to get that connection—who told me how Scotchmen get that way. Walt struck me as being a right guy to take along on a fishing trip. Eric Oberg, chipper as ever in spite of the added dignity of being an emeritus, and Westinghouse's Carl Nagel, on the ball as usual. A nice, representative gathering that, to all practical purposes, might as well have been a meeting of the ASTE, ASME or any other technical group come to acquire more knowhow in the making of things.

One chap opined that the sessions were a bit dry, but I noticed that he livened up plenty when the discussion hit him where he lived. Liked it myself despite four days of sinus headache—or whatever it is. Like bashing your head agin' a stone wall—feels so good when its stops. Wouldn't care to single out any one speaker as more interesting than the rest, although E. P. Bullard III won the crowd over with his naturalness and warm friendliness. Seems he lost one of his slides and it upset his timing. Turns out for the best, at times.

Luncheon speaker *par excellence* was Carl Taylor, prex of Waukesha State Bank, whose talk on "What Made America a Great Country" was a masterpiece of oratory. Best for home consumption, perhaps, a/c some of our foreign friends—and we have 'em, y'know—might not like to be reminded that they're so utterly (?) backward. As a matter of fact, there's some right smart guys among 'em and a lot of 'em came over here to help make us smart.

While in the neighborhood, dropped into a hospital to bid Au Revoir to a lifelong friend, now setting out to explore the Great Unknown. He was my first playmate when I came over some fifty years ago, and for many years we were inseparable companions. Well, the way of all flesh . . . and now, "turn down an empty cup." The world goes on.

A news release from Studebaker Corp'n saying, among other things, that the company has some 9000 employees in the middle age and over bracket, and they're all in there pitching. Well, why not? If all the men who've set the world afire after beginning life at 40 were to be mentioned in one ordinary sized book there wouldn't be room for more than their names, let alone bios. Try making a list of 'em, starting with Henry Ford and including men like Winston Churchill, Einstein, Leonardo da Vinci and so on, and let me know when you're through. No man is old until he loses his zest for work—and, of course, a bit o' play.

From Howard Nelson, Rockford, a letter saying that from Sept. '47 to Feb. '48, at least one speaker on every Rockford Chapter program has been an ASTE member. "This should indicate," says Howard, "that we can draw good talent from within the Society for most purposes."

Personally, I agree that we have sufficient talent within the Society for most purposes of our Chapters. Unfortunately, however, a lot of our members cannot absent themselves from their work to attend out-of-town meetings; however—and even though a prophet may have no honor in his home town—it would be well to list home talent so that, in the event that a guest speaker cancels at the last minute, a pinch hitter may be substituted. You may be surprised!

However, it's a good idea to inspect the other fellow's wares as well since, in this day and age, we can't know too much of what is going on in the technical world. And in the final analysis our ASTE meetings can be compared favorably with lectures in colleges with regard to education. Them's my personal views, not necessarily those of the Society.

From another ASTEer, a letter saying that since my visit to his Chapter—I won't say which—the "bald headed Americans" are really going to town. All this, of course, is apropos to nothing in particular and is mainly intended as an inspiration to venerable members—and others on the sunny side of the venerable—who may have grown out at the top. As the scientists tell us, if you really want a virile man pick a baldhead. . . . Well now, that reminds me. When at the Forum (mentioned above) I tested myself on the Westinghouse "Oomphmeter" thinking I'd run the needle out of sight. But all I got was "start eating oysters." But then, I topped Frank Oliver, and look at all the hair he's got!

Coming back to the Forum, Ray Woytech showed me an "average speed" speedometer he'd invented which is quite a gadget. You set it for the average speed you want to drive at, on a long trip, and you can tell at a glance if you're running on schedule. There's need for a thing like that; wouldn't mind having one on my own car. A visit from Russ Jornd, of Chi, who as tool engineer with Utility Mfg. Co. has had considerable to do with the development of a new flasher for automobiles. Russ was very enthusiastic over his gadget, which seems to be considerably simpler than the flashers now in use.

A letter from Jack Hawkey, indicating some slight perturbation a/c I'd called him one of my severest critics in the April Andygrams. But there was no sting in that; rather, I returned a compliment since it is largely due to constructive criticism that we've made THE TOOL ENGINEER what it is today. But as I've said before, we're not stopping; rather, we're committed to a program of month-by-month improvement—that is, barring occasional slips which happen now and then in spite of all precautions. Anyway, I am personally one of my severest critics. And that'll be all for now.

ASTEely yours,

Andy

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

1. Air Motors

A 16-page bulletin shows the various types of non-rotating, double-acting, reciprocating power units with built-in valve, valve operating controls and independent piston stroke speed controls. *The Bellows Co.*, Akron, O.

2. Bearings, Cylindrical Roller

A 16-page manual of selection and installation data on the Tru-Rol steel cage type roller bearings, available for direct shaft application or with use of separable inner race. *Rollway Bearing Co., Inc.*, Syracuse, N. Y.

3. Comparators, Internal

Electrolimit internal comparators, which gage internal diameters of parts accurately and rapidly by combining mechanical gaging with electrical magnification, are fully described in new 16-page bulletin. Comparators are set to the desired size with a master and parts are then compared with the size of the master. *Pratt & Whitney Div'n*, Niles-Bement-Pond, West Hartford 1, Conn.

4. Cylinder, Hydraulic

A 26-page catalog covers the entire line of Hydro-Line standard hydraulic cylinders available in a range of sizes from 1½" through 8" bore in various mounting types. Complete specification tables are included. *Hydro-Line Manufacturing Co.*, 711 19th St., Rockford, Ill.

5. Flexible Shaft Handpieces

Six-page folder illustrates and describes the reciprocating handpieces for precision filing, honing, lapping; the quick-change hand grinders for routing, grinding, drilling, polishing; the cam-driven hammers for riveting, peening, and hammering delicate work. *Speedo Mfg. Co., Inc.*, 48 W. 48th St., New York 19.

6. Fabricating, Light Metal

Engineering, tooling and production facilities offered by sheet metal fabricator specializing in light metals are described in 20-page booklet, which also gives "points to check in selecting a fabricator." *Colgate Mfg. Corp'n*, So. Bayview Ave., Amityville, L. I., N. Y.

7. Grinding, Internal

"What's in a Hole" is a pocket booklet which presents a philosophical approach to the importance of the hole in modern industry and to the part the Bryant Chucking Grinder plays in precise finishing of the hole diameter. *Bryant Chucking Grinder Co.*, Springfield, Vt.

8. Hardness Tester

Catalog insert describes production Brinell Testing Machine capable of checking up to 800 pieces per hour, parts varying in diameter and thickness as much as ¾". *Steel City Testing Machines, Inc.*, 8843 Livernois Ave., Detroit 4.

9. Infrared Applications

Radiant heat processing for metal-working, plastics, textile, leather, graphic arts, glass, rubber and other industries are described in a new 16-page booklet (A-3817) of case histories, "Modern Baking, Drying, Heating With Industrial Infrared Lamps." Lamp Div'n, *Westinghouse Electric Corp'n*, Bloomfield, N. J.

10. Laboratory, Magnetic

Magnetic laboratory services, available to industry, are described in bulletin. Laboratory analyzes materials to determine best method of magnetically separating them and designing the equipment for this. *Dings Magnetic Separator Co.*, 4740 W. McGeough Ave., Milwaukee 14.

11. Lathe, High Speed

A 28-page bulletin offers detailed info on the DV59 high speed precision lathe, featuring hardened and ground steel dovetail ways, center-drive preloaded ball bearing headstock, eight speed driving unit (variable speed optional), and totally enclosed and ventilated electrical equipment. *Hardinge Brothers, Inc.*, Elmira, N. Y.

12. Pre-Plated Metals

Many diversified applications of the pre-plated nickeloid metals are illustrated in new 20-page booklet "G". Also shown are various forms in which these metals are offered—sheet, coil, flat wire—plated one side or both in bright or satin finish, colorful tints, or attractive patterns. *American Nickeloid Co.*, Peru, Ill.

13. Press Room Equipment

Bulletin covers entirely self-contained Hydraulic Stock Feed, efficient Stock Straightener, and quickly installed Scrap Cutter, all for use on punch presses with stock up to 3/32" thickness and 4" width. *Haller Machine & Mfg. Co.*, 7940 Tireman, Detroit.

14. Presses, Hydraulic

A 12-page bulletin illustrates various types of hydraulic presses, with the center spread showing 28 jobs actually performed on these presses. *Air-Hydraulics, Inc.*, 401 Broadway, New York 13.

15. Pressure Instruments

Eight-page bulletin covers the Pressuregraph, an electronic instrument for measuring and recording dynamic and static pressures. Supplementary equipment includes the Synchro-Marker for extended pressure-time studies. *Electro Products Lab., Inc.*, 549 W. Randolph St., Chicago 6.

16. Production Control

Bulletin describes Chart-O-Matic, the table-top machine consisting of a continuous graph chart on rollers, electric-motor-driven. This method provides an immediate visual record of all plant activities with all the advantages of compactness, economy, time saved, and permanency. *Spiral Mfg. Corp.*, 3612 N. Kilbourn Ave., Chicago 41.

17. Radial Tool Guard

Circular gives complete details of important new safety guard for all portable horizontal tools. A far cry from the half hood, this guard minimizes the lateral ejection of slag, wires, metal dust or chips; minimizes wheel breakage; and stops broken wheel velocity. *Flohr Safety Equipment, Inc.*, Buffalo 17.

18. Relays, Multiple Arm

Bulletin features new line of general purpose sensitive multiple arm relays. Relays are small, rugged, and adaptable to a wide variety of circuit arrangements. Details include minimized mounting area, vertical balanced armature, unusually high contact pressures, and shock and vibration resistance. *Signal Engineering & Mfg. Co.*, 154 W. 14th St., New York 11.

19. Riveters, Pneumatic

Bulletin No. 74 tells how risk is removed from riveting on unsupported work and brittle materials—glass, ceramics, plastic, wood, enamel ware, and hollow ware—by using Airflex Riveters, which combine the straight line blows of pneumatic hammer with rapidly rotating peen, eliminating transfer of stress to workpiece. *Lemert Engineering Co.*, Plymouth, Ind.

20. Safety, Plant

"AL", the little guy who typifies Allegheny-Ludlum, has taken a new role as safety engineer to caution that company's employees on the more common hazards and to give them a few healthy and helpful hints on how to stay in one piece. This novel 20-page book may give you a new slant on presenting the safety story to those under your supervision. *Allegheny Ludlum Steel Corp'n*, Pittsburgh 22, Pa.

21. Sapphire, Industrial

"Why Sapphire?" presents technical data on the properties of synthetic sapphire, and includes reprints of authoritative articles appearing recently in industrial publications. The wide application of sapphire in industry is covered, as well as its hardness, toughness, specific heat, and coefficient of friction as compared with other materials. *Sapphire Products Div'n, Elgin National Watch Co.*, Aurora, Ill.

22. Saws, Milling

Folder features triple-chip efficiency, dual drive (eliminating keyway drive), interchangeability, and range of pitch offered by M & M Slitting Saw Blades for Milling Operations. *The Motch & Merryweather Mach. Co.*, Penton Bldg., Cleveland 13, O.

23. Tap Reconditioner

All operations necessary for keeping taps in "good" condition—chamfering, spiral pointing, spiral point polishing, and grinding full length of flutes—can be quickly and accurately performed on machine described in 4-page folder DTR-4. *Detroit Tap & Tool Co.*, 8432 Butler Ave., Detroit 11.

24. Tooling Service

Folder describes the facilities of this manufacturer, specialist for nearly four decades in fine tools, and announces the availability of its engineers, toolmakers, and diemakers as part of the client's production system. *Nueske Tool & Machine Corp'n*, 45-18 Court Square, L. I. City 1, N. Y.

25. Valves, Hydraulic

Comprehensive 52-page catalog lists engineering, specification, and application data —with illustrations—for a complete line of globe, needle, check, relief, and plug valves, also specialized valves. *The Parker Appliance Co.*, 17325 Euclid Ave., Cleveland 12, Ohio.

26. Weldment Fabricators

Album shows a number of difficult and diversified weldments recently made to obtain such advantages of welded construction as rigidity, lightness, economy, predictability, and facility of changing design. *The United Welding Co.*, 1982 Lafayette St., Middletown, O.

North East West South
IN INDUSTRY

Recent appointments at **Reynolds Metals Co.**, Louisville, Ky., include **Leon Norfleet**, Industry Mgr. of the Marine Div'n; **Lee Stratton**, Merchandise Dir. of the Parts Div'n; and **Ray W. Christensen**, Ass't Adv. Mgr., Aluminum Div'n.

Arthur J. Wieland, who had been Vice-Pres. in Charge of Distribution, has been advanced to the newly-created post of Exec. Vice-Pres. of **Willys-Overland Motors. Walter D. Appel**, former Ch'f Eng'r, has been appointed Director of Purchasing.

George E. Richardson has been appointed Ass't to the Mgr. of the **Feeder Div'n** by the **Westinghouse Electric Corp'n.** He has been with Westinghouse since 1930.

Eugene W. Stetson, Jr. was recently elected a Director of **The Yale & Towne Mfg. Co.** He is Ass't Vice-Pres. of the Chemical Bank & Trust Co. and is Director or Trustee of several other organizations.

W. A. Roberts and **W. C. Johnson**, Executive Vice-Presidents of **Allis-Chalmers Mfg. Co.**, Milwaukee, have been elected Directors of the firm.

Three newly created offices at **The Louis Allis Co.**, Milwaukee, have been filled by **Louis Allis, Jr.**, Vice-Pres. in Charge of Sales; **Frank O. Kovich**, Vice-Pres. in Charge of Mfg.; and **T. R. Wieseman**, Vice-Pres. in Charge of Eng'g. Recent appointments include **C. G. Skidmore**, Sales Mgr.; **James H. Daganhardt**, Ch'f Eng'r; and **John J. Kirckish**, Ch'f of Elect. Design.

The American Cyanimid Co., New York, has acquired the **S. T. Dahl Co.**, Los Angeles, sales agent for the **Industrial Chemicals Div'n of American Cyanamid** since 1925, and the **Plastics Div'n** for the past several years. Personnel of the Dahl organization will be retained, under the direction of **Sheldon T. Dahl** as West Coast Sales Manager.

Andersons, Inc., Chicago mfrs. of small tools, jigs, and fixtures, and contractors in production machining and grinding, have moved into their new ultra-modern plant at 6603 Diversey.

Bernard Lester, one of the foremost authorities on industrial marketing, is now offering a sales and distribution consultation service to medium and small industrial equipment builders. He has opened offices at 140 Cedar St., New York.

Swan-Finch Oil Corp'n, New York, has elected **Ernest V. Moncrieff**, formerly pres., to Chairmanship of the Board, and **Howard F. Moncrieff**, formerly vice-pres. in charge of sales, as Pres.

B. H. DeLong, Vice-Pres. and Tech. Dir. of **The Carpenter Steel Co.**, Reading, Pa., has been awarded the Bradley Stoughton plaque for outstanding metallurgical service, by the Lehigh Valley Section, American Society for Metals.

S. A. Brandenburg

Kermit T. Kuck

Directors of **The Monarch Machine Tool Co.** recently elected **Stanley A. Brandenburg**, Gen'l Sales Mgr., to the office of Sales Vice-Pres. and **Kermit T. Kuck**, Chief Eng'r, to that of Eng'g Vice-Pres.

Recent elections of the **Institute of Mathematical Statistics** elevated **Prof. Abraham Wald**, Columbia U., to the Presidency; **Prof. Henry Scheffe**, U. of Cal. at Los Angeles, V. P.; and **Dr. Churchill Eisenhart**, Nat'l Bur. of Standards, V. P.

Joseph R. Lex has moved up to the post of Ass't Gen'l Mgr. of **Progressive Welder Co.**, Detroit, which he joined in 1946 after a broad experience in industry, including being Plant Mgr. of Fisher Body Welding Div'n.

Tyson Bearing Corp'n, Massillon, O., have reorganized their sales organization to facilitate service to their customers and distributors. **George C. McMullen**, Vice-Pres. in Charge of Sales, has been with the corporation for 16 years and is widely recognized as an authority on design and application of anti-friction bearings. **W. H. Oexle**, formerly with the L. S. Starrett Co., joins Tyson as Gen'l Sales Mgr. **Herschel J. Deal**, a V.P., who joined Tyson in 1933 as a metallurgist, will operate from Chicago in charge of the midwest area. **Ivan C. Mann** has moved up to Ass't Sales Mgr. from the post of Mgr. of Replacement Sales.

Walter E. Winfrey Co., Cambridge, Mass., is representing Acme Tool Co., N. Y., in Eastern Mass., R. I., N. H., and Me. for the Acme line of universal precision tool holders, tool bits, boring bars, and internal threading tools.

M. A. Self, formerly sales mgr., has been elected V. P. in Charge of Sales and a Director of the **Bee Chemical Co.**, Chicago.

Farrel B. Weber, newly appointed Sales Mgr. of the **Micromatic Hone Corp'n**, Detroit, joined the organization in 1945 and figured in the development of electronic controls for automatic sizing. **A. J. Prentice**, Sec'y-Treas. since 1931, has resigned his duties as Sec'y. That office has been filled by **Gerald Carlisle** who also retains the position of Ass't Treas.

Theodore I. Leston, director of production, has been appointed V. P. in Charge of Production for **Eutectic Welding Alloys Corp'n**, New York. Mr. Leston's background includes association with Madame M. Curie at the Faculte des Sciences, covering preliminary phases of atomic research.

The Studebaker Corp'n, So. Bend, Ind., announces the election of **Stanwood W. Sparrow** as V. P. in Charge of Eng'g.

The A. R. Shevlin Co., Boston, Mass., has been appointed representative for **Detroit Broach Co.** in the states of Me., Vt., R. I., Mass., and part of Conn.

D. E. Brown, of the Rockford office of **Barber-Colman Co.**, has been appointed to take charge of the Cincinnati sales office, replacing Mr. M. N. Hough who has retired.

The Bellows Co., Akron, O., mfrs. of "Controlled-Air Power" devices, have created five regional sales divisions to better service their clients. **Harold P. Granger** was the first regional sales manager appointed, to head the Eastern Div'n.

Barnes & Reinecke, Inc., Chicago, recently held open house, while exhibiting three new complicated automatic machines they had engineered. This firm, now well known in industrial design, recently acquired the old established **Shoberg Tool Company's** facilities, which have been converted for a new machine engineering and building division.

COMING EVENTS

May 31-June 12. INTERNATIONAL TRADE FAIR. Toronto, Canada.

June 6-11. SPECIAL LIBRARIES ASS'N. 39th Annual Convention. Hotel Statler, Washington, D. C.

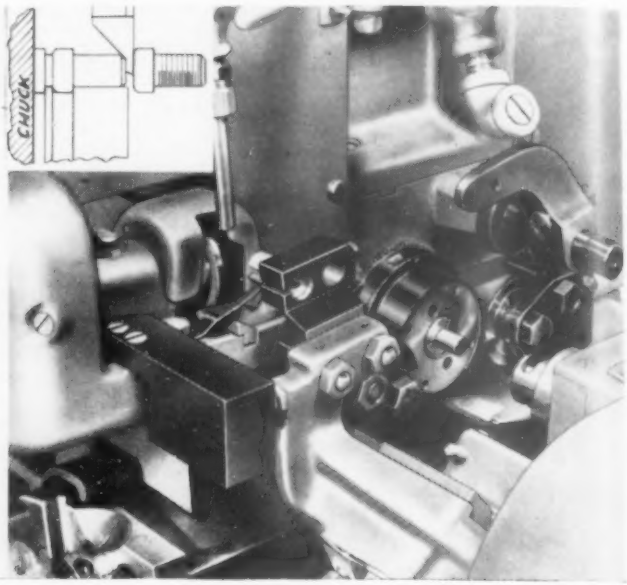
June 21-26. AMERICAN SOCIETY FOR TESTING MATERIALS, Annual Meeting and Exhibit. Detroit.

June 26-Sept. 11. INTERNATIONAL INDUSTRIAL EXPOSITION. Million Dollar Pier, Atlantic City.

June 28-July 1. ANNUAL INDUSTRIAL FINISHING EXPOSITION AND CONVENTION, sponsored by American Electroplaters' Society. Convention Hall and Ambassador Hotel, Atlantic City.

TOOLS OF TODAY

New Brown & Sharpe Automatic Screw Threading Machine



At left, the new Brown & Sharpe Automatic Screw Threading Machine. At right, an enlarged view of the work spindle, die spindle and screw slotting attachment. Inset shows tool setup for simultaneous tandem production of a screw.

Especially designed to take full advantage of overlapping operations, a new automatic screw threading machine, by the Brown & Sharpe Manufacturing Company, promises an unusually high production of screws, nuts and bushings. Furthermore, the design cuts down-time to a minimum.

In this machine, which in general is similar to the Brown & Sharpe automatic screw machine, having all their latest improvements and refinements, both the work spindle and threading spindles rotate in the same direction but at different speeds. Thereby, the work rotates at the correct speed for turning or other operations, while the differential provides for right threading speed.

Threading dies are backed off simply by automatic stopping of the threading spindle which, for production of bushings, serves as a drill spindle. A slotting mechanism provides for slotting screws and, when tapping, the transfer arm of the slotting mechanism provides for drilling the hole in the work previous to tapping.

Sixteen work spindle speeds—5000 to 454 RPM—provide cutting speeds for any material, while 32 threading speeds —7000 to 545 RPM—give 32 changes of thread cutting speeds from 2000 to 91 RPM. The machine takes stock $\frac{3}{8}$" diameter and threads any length to 1". Maximum and minimum distances, front of chuck to face of die, $2\frac{7}{8}$" and $\frac{1}{8}$". Many attachments, available with the machine, makes it possible to perform auxiliary operations, thereby eliminating rehandling and the use of a second machine to complete the work. **T-5-1**

Multi-Operation Tools

A new line of multiple operation carbide tipped **Cutting Tools,** by the R. F. Cook Mfg. Company, has been developed to ream, chamfer and counterbore simultaneously and without extra in-between handling.

A feature of these tools, which may be had for a wide variety of operations, is that they can be resharpened without affecting either shoulder lengths or diameters because the cutting teeth are form relieved. The maker claims to hold them within .0005" limits of tolerance. **T-5-2**

H. D. Drawing Compound

A heavy duty Compound for drawing steel, designed primarily for use without dilution and identified as Super-Draw M-106, is announced by the Northwest Chemical Company. If necessary, however, it may be thinned up to two parts of warm water, by volume, to one of the compound. Relatively low in pigment, and homogenized, its suspension is stable even at maximum dilution.

It is unnecessary to remove the compound from parts before welding, and its anti-corrosive qualities make practical storing drawn parts longer, prior to cleaning, than when using other pigmented compounds. It is said to clean readily in pressure equipment, is sterilized to prevent bacterial growth, is non-injurious to the skin, may be applied by brush, dip, roll, or spray, and spreads well, whether the blank surface is dry or oily. **T-5-3**

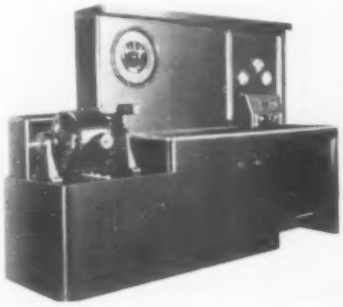
New Rubber Stock

A new synthetic rubber material—Fel-Pro 131—has been developed by the Felt Products Manufacturing Co., which claims for it a set of specifications as yet unmatched by any other commercial stock. Reports of laboratory tests are summarized as follows: 1,800 psi tensile strength; 400% (Plus) ultimate elongation; 2% maximum swell in A. S. T. M. fuels and oils; high temperature resistance (300° F., hot oil); flexibility retained with no cracking at –55° F; resistance to abrasion and no surface deterioration on aging; and a Durometer hardness (Shore "A" type) up to 80, plus or minus 5.

The report states further, that the synthetic can be furnished in the specified hardness of stock required, and that it can be cut, molded or extruded to suit the individual application. **T-5-4A**

Absorption Dynamometers

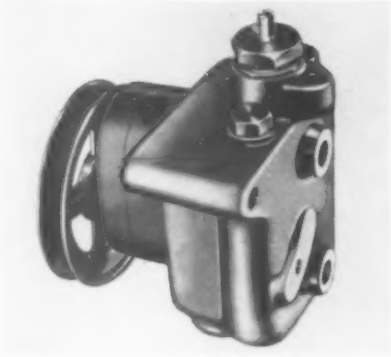
A new 25 h.p. transmission and absorption Dynamometer—EMDCO Model E—with a speed range of 200 to 6500 r.p.m. and announced by the Electro Mechanical Devices Company, is designed for testing gasoline engines, electric motors, air compressors, fluid motors, fuel pumps, and gear pumps.



A completely self-contained unit, with the motor generator set mounted and wired in the base, the user need only connect his three-phase wires and lag the unit to the floor to make it ready for operation. Another feature is unusually simple control. One control is used for all tests—no switching from motoring to absorption—and change is made automatically when the rheostat control increases or decreases in relation to the speed of the unit being tested. Torque is read clockwise on a scale, regardless of direction of rotation, and is also read directly in foot-pounds, making conversion unnecessary. **T-5-4**

Midget Hydraulic Power Unit

"Ten-Ton-Tony", as it is named by Hydro-Power Division, The Hydraulic Press Mfg. Company, is a midget size hydraulic unit readily adaptable to plant maintenance, service repair, farm and road machinery, and industrial uses. In the latter capacity, it can be put to efficient use on such applications as arbor presses, hydraulic clamping vises, forming, straightening, and bending devices.



The unit measures 6" × 7" × 9" overall, has a capacity of 3 gallons of oil per minute at 1200 RPM at 1000 psi or 4½ g.p.m. at 1800 RPM at 1000 psi. It requires approximately 2½ horsepower to operate at 1200 r.p.m. **T-5-5**

Carbide Tool Grinder

A carbide Tool Grinder—Model CH-105—by the United States Diamond Wheel Company, Aurora, Ill., provides both the first cost economy required by small shops and the long time saving demanded by larger plants. Equipped for wet grinding, the machine is engineered for smooth spindle speeds of 9000 RPM. This provides the high surface speed required for small, comparatively inexpensive wheels and makes them cut faster with more efficient performance.

Designed for tools up to 1" shank, the machine has a full ¾" wide grinding wheel surface and a smooth table movement at convenient operator height. Table angle is easy to read, and an all-angle vise provides for quick setup without any shimming of the tools. **T-5-6**

"Economy" Stock Pusher

A new Stock Pusher—called the Economy, by Sheffer Collet Company—is designed to feed to the very end of the stock. This is accomplished by means of a dual bearing, one in mid-section and one in the nose, thus providing considerably larger bearing length with a corresponding lighter spring tension in each bearing section.

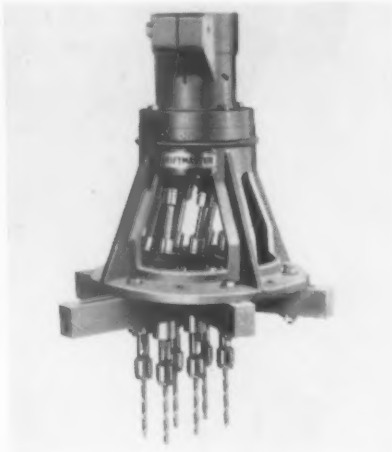
This lighter grip, which is distributed over a broader area, greatly reduces wear and fatigue and results in a positive feed. The pushers are said to be especially effective on long feed-outs where feeder travel is greatly accelerated. Furnished in any stock size from ¼" upward. **T-5-7**

Hyprez Diamond Compounds

Mold and die makers, for plastics products and die castings, will be interested in the high mirror finishes said to be made possible by use of Hyprez Diamond Compounds, available from Hyprez Division, the Engis Equipment Company.

Advantages claimed from use of the compound are: parts produced from Hyprez finished dies are readily ejected; they require but a fraction of the buffing or polishing work ordinarily required; and they lend themselves particularly well to decorative application where plating is required. In addition, dies are said to stand up for longer runs because the polish is lasting in spite of the high temperature to which die cavities are subjected. **T-5-8**

New Adjustable Drillhead

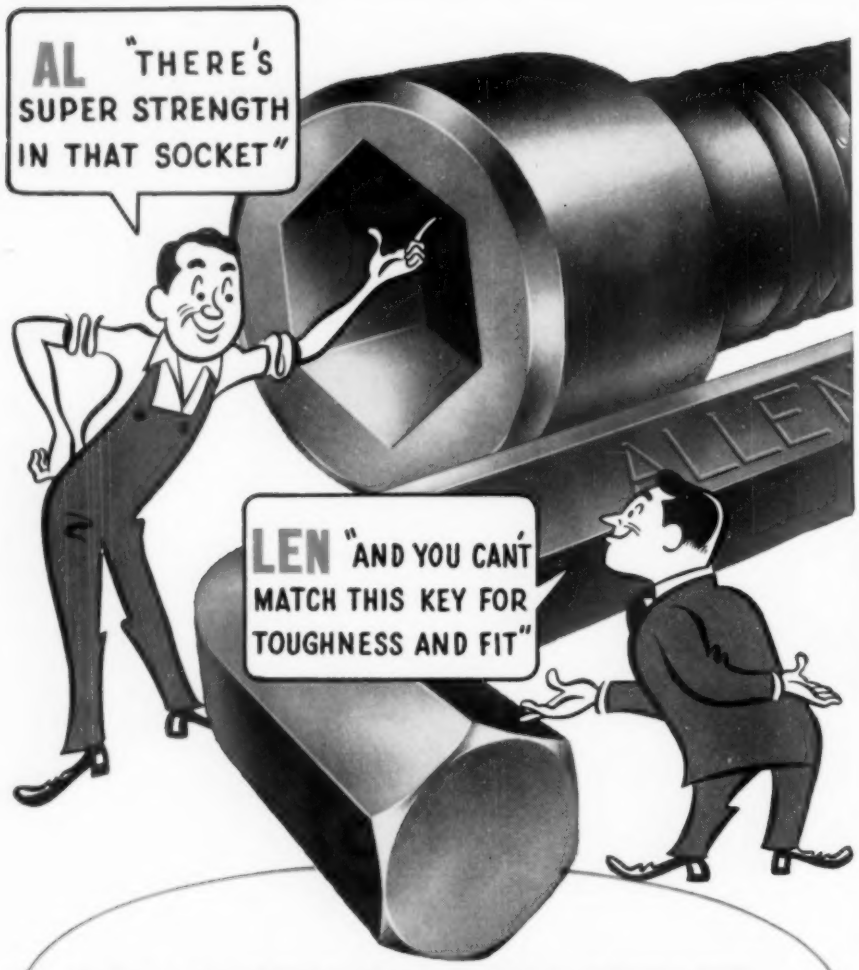


A new adjustable full ball bearing mounted Drillhead, by Thriftmaster Products Corp'n, features flexibility of operation and unusually strong construction together with high overload capacity. Rating, at full capacity, is ¼" in steel. Made for righthand rotation of the drill press, with drive through universal joint. **T-5-9**

Water Soluble Oils

Translated to commercial production, a recent development, by the Glyco Products Co. Inc., now makes available in commercial quantities a number of chemical esters, of an oily character, that dissolve clearly in water. Chemically, these products are polyoxethylene oleates and laurates having a molecular weight above 800. They are non-ionic, non-toxic, light in color and fluid or grease-like in consistency, and dissolve clearly in water, alcohol, esters, hydrocarbons and vegetable oils.

The above properties indicate their use as special detergents in textile and fiber processing; as penetrating lubricants; grinding media for pigments; as plasticers for water dispersed products and water-insoluble resins, elastomers, plastics, coating; and as emulsifying agents for oils and hydrocarbons. **T-5-10**



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ALLEN HEAD

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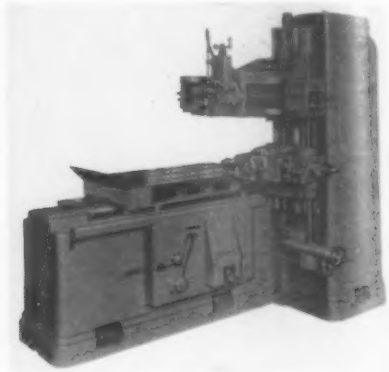
NEW YORK, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

New Openside Shaper

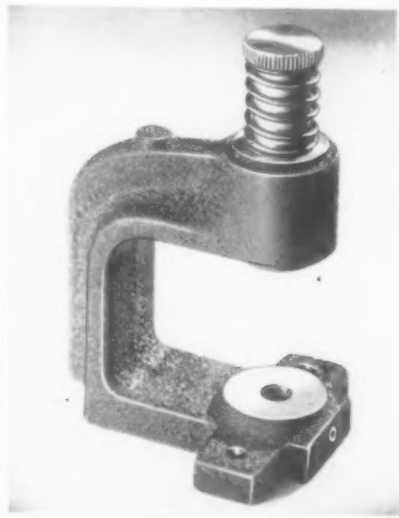
The Hy-Draulic Openside Shaper, by the Rockford Machine Tool Company, has been redesigned to provide greater safety and improved operating efficiency. Two new advantages are: greater range of application due to new heavier column and rail, and greater ease of operation and setup is achieved because of dual controls, for table operations, located at either side of the machine.



Safety devices incorporated in the stop and start lever assemblies prevent accidental starting of the table. All other advantages are retained, such as fast cutting and return strokes with infinite speed selection between wide range low and high. As extra equipment, power rail elevation is available to further simplify setup work. **T-5-11**

Self-Aligning Sub Press

Designed for use with air, arbor, kick or punch presses, a self-aligning Sub-Press, by Paragon Products, eliminates the need for time-consuming setups for punching, piercing, staking, assembling and other operations on small parts.



With this set, the setup is left permanently in the sub-press; thus, when a specified job is called for, the unit can be quickly mounted on the bolster and as quickly removed when the run is completed. The tool is precision made, with the ram moving in an Oilite bearing. **T-5-12**

New Carbon Arc Torch

A new, low price carbon Arc Torch, for use with AC welding machines, by the Lincoln Electric Company, is designed to extend the use of welding equipment to jobs where application of heat is desired without melting the workpieces.

The arc torch produces a high temperature flame between two copper coated carbon electrodes clamped in aluminum alloy jaws, the latter holding together either a 5/16″ or ⅜″ diameter carbon without other adapters. A simple thumb control, in the handle, is geared so that a slight movement adjusts the distance between the carbons and also maintains the angle. Leads are conventional, one clamping to the welder's regular electrode holder and the other to ground.

The new arc torch is said to be applicable to all types of brazing and soldering work, hard surfacing of thin materials, and is suitable for jobbing, production or maintenance work, as well as to miscellaneous applications. **T-5-13**

Long Shank Masonry Drill

A new, carbide-tipped Masonry Drill, recently announced by the Wendt-Sonis Company, is designed for deep hole drilling as well as shorter depths. It is suitable for drilling through wall partitions, concrete floors and all types of masonry construction. A new diamond shape provides ample clearance to allow hole to clean as it is drilled. The drills are available in sizes from ¼″ to 1½″ diameter and 6″ to 18″ lengths. **T-5-14**

Synthetic Wax for Drawing

A new synthetic Wax, developed by the Glyco Products Co., Inc., is said to have been proven highly efficient and economical for the dry drawing of high carbon steels. Alone or in combination with other common ingredients, this product—called Acrawax C—is said to remarkably reduce friction and heat and to decrease scratching and wire breakage. Considerable increase in drawing speeds, with longer die life and improved surface finish are also claimed for the product. **T-5-15**

ALL THIS . . .

LONGER TOOL LIFE . . . LESS DOWN TIME . . .

CLOSER TOLERANCES . . . FEWER REJECTS

COOLER, CLEANER WORK

A TOOL SAVING FLUID

AND AT FAR LOWER COSTS

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Ames indicators in any size or dial graduation may be attached. The No. 211 shown is graduated in .0001", has dial reading 0–5–0, and a range of .025".

Specifications

Capacity under contact: 2" Height, overall: 9½"
Table diameter: 2" Throat, contact to column: 1½"
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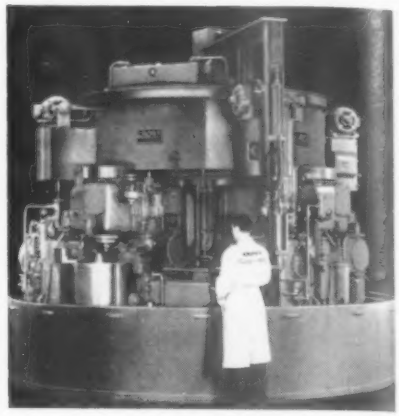
Representatives in principal cities

Oil Well Tool Miller

Embodying the general features of the company's line of high production tools, a new 4-station Continuous Cycle Machine, by the Cross Company, greatly speeds up the machining and threading of oil well tool joints. Accuracy and surface finish are also said to have been improved even beyond the exacting demands previously established.

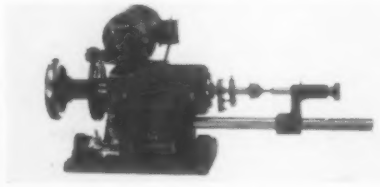


Output, at a righer rate of efficiency, is assured because the machine sets the pace for the operator, who has merely to load, unload and press a button. Power rapid traverse then automatically positions the work, then the entire machine rotates with the stations coming to the operator as the parts are completed. Four workpieces are finished with each revolution.

Rough and finished cuts are taken at the same chucking, thus providing uniform stock for finishing, and each of the four stations is individually insulated from external vibrations. A Servo-controlled hoist lifts the part in and out of the hydraulically operated chucks; thus, the operator does not have to lift the workpieces. **T-5-16**

New Radial Relief Fixture

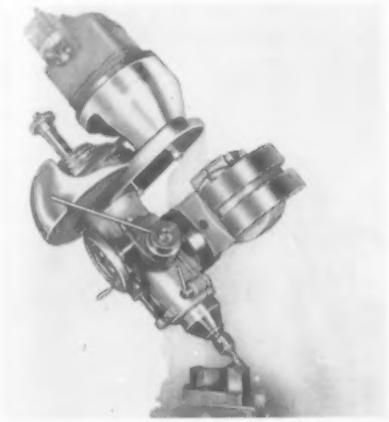
In line with the growing recognition of the advantages of radial-relief grinding of cutters, as compared to conventional back-off, Glenbard Tool Mfrs., Inc., have developed a radial-relief Fixture which reduces the grinding to a comparatively simple process.



The fixture, which replaces the headstock of a universal grinder, employs no special cams. Indexing is controlled by a gear change, and because gear indexing is used, all teeth are cut in a true circle with the center lines remaining parallel to the axis of the grinder. This permits true dressed forms to be reproduced radially and spirally without trial and error or compensation.
T-5-17

New Milling Mounting

Change-over, of Rusnok milling heads, is now quickly effected by means of a new **"Rail Type" Mounting** developed by the Rusnok Tool Works. The new mounting is fully universal, with brackets available and custom fitted to milling machines with round over-arm with a range of 3" to 5" diameter.



The mounting is readily adaptable to any old or new Rusnok milling attachment and provides a multiple quick change-over machine of great versatility. The attachment is quickly mounted and rigidly locked in any position within a full 180° adjustment.

T-5-18

New Form Zinc Anode

Electroplaters will be interested in a new form of Zinc Anode, recently introduced by Wagner Brothers. Known as "Flat Top" because of its shape, this anode is so distinctive in appearance that it prevents confusion with cadmium or tin ball anodes. Thus, there is no danger of mixing plating solutions with consequent loss of time and materials from shut-downs and dumping of plating tanks. **T-5-19**

New Keyway Broach Kit

An addition to their line of keyway broach kits—the **"Minute Man" Kit**—for cutting all standard keyway sizes approved by the American Standard Association is announced by the du Mont Corporation.

The new kits are available with both carbon steel and high speed steel broaches. Bushings are provided for all hole sizes from $\frac{1}{2}$" to 1 $\frac{9}{16}$" by sixteenths.

To use, it is only necessary to drop the right size bushing in the bore, place the broach of the desired width under the arbor press and in the bushing slot and press it through. The exact depth of keyway is obtained by using shims likewise provided in the kit. All kits are furnished in sturdy hardwood cases.

T-5-20

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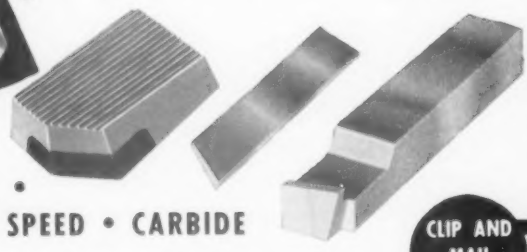

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CINCINNATI 23, OHIO

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New Line of Stock Reels

Added to the present line of automatic roll feeds, stock straighteners and scrap cutters, by the LeBahn Machine & Mfg. Company, is a completely new line of **Stock Reels and Scrap Winders.** A typical motorized reel is illustrated.

More than 25 different models are included in the new line. Reels are available in spoke or disc type, plain, automatic brake or motorized spindles, with self centering features available on most models. Capacities range from 150 to 1000 pounds, and reels may be titled from vertical to horizontal. Adjustable stock guides are included on most models. **T-5-21**

"Metalmaster" Grinder

A new line of bench and pedestal type Grinders and Buffer-Polishers, equipped with full 1 HP, 110-220 volt, 50/60 cycle, single phase motors, was recently announced by the Bradford Machine Tool Company. Known as the "190" series, these "Metalmaster" tools are to be had in eleven tool models of which Model 191 (illustrated) is a combination grinder and buffer on a pedestal mount. Standard equipment for both includes safety glass eye shields, spark breakers, tool tray, and water pot.

Seven buffers are included in the "190" series, and full information on the entire line may be had in descriptive literature. **T-5-22**

setting **NEW PERFORMANCE RECORDS!**

Procunier Tapping Machines With the NEW "Hi-Boy" Lubricating Pump

Here is one of the greatest improvements in tapping machines in years! This new Procunier "Hi-Boy" lubricating pump makes for cleaner, faster tapping . . . **better performance under all conditions.** Tested for years on every kind of tapping operation . . . these new "job tested" pumps are the motor driven gear type. They provide a continuous **measured** flow of lubricant to the tap at all times . . . while the tap is "backing out" as well as during the actual tapping operation. As a result of this continuous flow of lubricant you make the **deeper cuts with greater ease** . . . tap in the tougher, harder metals with **less tap breakage.** The famous Procunier foot pedal mechanism enables the operator to keep both hands free for work. The unique compensating springs may be pre-set for proper pressure to tap . . . regardless of pedal pressure. The result is high speed, uniform tapping with a minimum of broken taps . . . **better performance on every job.**

Phantom View showing how the new "Hi-Boy" pump assembly is mounted on the rear of the machine.

Get all the facts of this new Procunier foot pedal tapping machine. . . . Write today for free illustrated folder giving complete specifications and prices.

Procunier
Safety Chuck Company

PROCUNIER SAFETY CHUCK CO.,——
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Gentlemen: Please send me your illustrated brochures which give complete prices and specifications on Procunier High Speed Tapping Heads and Machines.

Name .....

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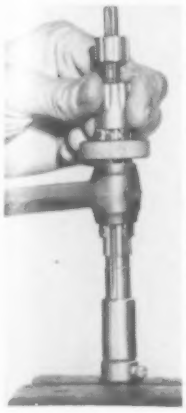
"Utility" Marking Holder

The Cunningham "Utility" Marking Holder, for marking etched plates, tags, keys, stock checks; brand names or stock numbers on steel bars; special coding, serial numbering, identification and inspection, is now available in a wide range of slot sizes.

The new range of "Utility" Holder sizes runs from ¼" up to 2" slots, making possible the stamping of long part or stock numbers, down to short serial numbers in the smallest type sizes. Nine sizes of type characters, from 1/32" through ¼" sizes, may be used in the same "Utility" holder. **T-5-23**

Tru-Size Reaming

While following original design principles of the line, the new single blade **Expansion Reamers**, by the U. S. Reamer & Tool Corp'n, are now provided with standard and oversize ring gages which permit reaming soft metal bearings, including piston pin bearings, to exact diameters.



After selecting the desired size ring gage, it is slipped over the reamer, which is used in the usual way. When, however, the hole has been reamed to proper size, the ring gage prevents further expansion.

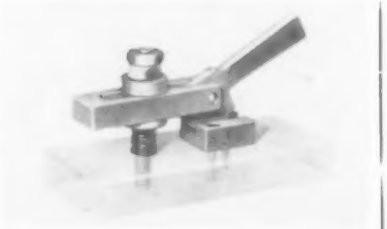
In addition to the Tru-Size ring gages, the U. S. reamers have a tungsten carbide blade which produces an accurate ream finish and which is said to last indefinitely. Accuracy is attained by use of the single expanding blade and independently expanding guide sleeve which provides a positive support in the hole being reamed. **T-5-24**

New Floating Disc Clutch

New design features have been added to the Maxitorq Clutch, by Carlyle Johnson Company, which now supplies the Maxitorq Floating Disc Clutch equipped with non-locking type levers. They are so designed that the clutch cannot be locked in engagement.

This type of clutch may be used on machinery equipped for foot pedal operation, or where engagement of clutch is rapid or frequent; for rapid traverse mechanisms, or for any other operation or application where it is preferred not to lock the clutch when engaged. **T-5-25**

M-T FIXTURE CLAMPS and COMPONENTS



There is a M-T Fixture Clamp and Fixture Component to meet your most *exacting* requirements.

Immediate Delivery

Write for catalog and price list.

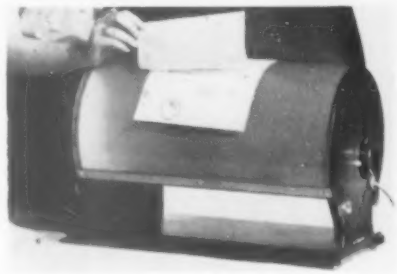
MORTON MACHINE WORKS

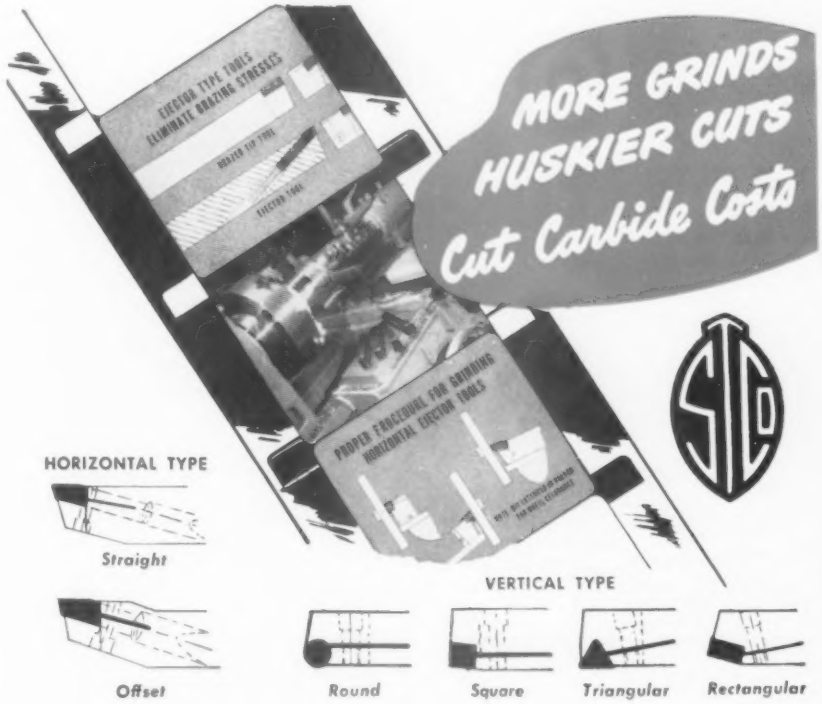
2422 Wolcott Detroit 20, Mich.

New Photocopy Unit

A new, improved **Photocopy Unit**, by the American Photocopy Equipment Company has a built-in dial-controlled filter that simplifies and speeds up reproductions at the rate of 60 or more copies an hour. A hard plastic printing surface is said to insure absolutely uniform contact between copy paper and original and to produce prints of sharper and cleaner definition. Still another new design feature promotes more even diffusion of light, insuring clarity of reproduction right up to the edges of the print.

Operating in subdued office light, without lens or darkroom, this unit is designed to copy photos, drawings, blueprints, press clippings and printed forms from originals up to full newspaper page size. **T-5-26**





SUPER EJECTOR TYPE TOOLS

Super is first with a complete line of standard Horizontal and Vertical Ejector Type Tools with carbide inserts in 20 types.

With Super's designs, you get greater depth of cut demonstrated in actual production—plus less down time, more grinds for your carbide dollar and greater diamond wheel economy. Super's hardened, long life holders designed to eliminate stresses and strains that cause carbide failure, can be adapted to inserts of special sizes and shapes.

★ Our new slide film, "Advantages and Economies of Ejector Type Tools," is now available for showing before tool groups. Write for information.

STANDARD AND SPECIAL SUPER *Carbide Tools*

SUPER TOOL COMPANY

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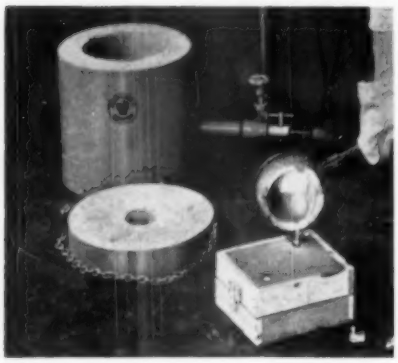
Midget Melting Furnace



A Small Melting Furnace, complete with all equipment and tools necessary to produce small sand and plaster mold non-ferrous castings, is announced by the Sawyer Bailey Corporation. Designed for college and laboratory as well as commercial use, the outfit is practically a complete foundry on a miniature scale.

The outfit includes furnace, crucibles and holder, tongs, skimming and stirring rods, asbestos gloves and goggles, together with special grade foundry sand, flask, riddle, rammer and necessary tools.

The furnace will hold crucibles of working capacity up to 10 lbs. of aluminum or 34 lbs. of brass. **T-5-27**

MAXITORQ KEEPS GOOD COMPANY

ANOTHER manufacturer, the Lewis-Shepard Company, has selected Maxitorq Floating Disc Clutches for the power transmission assembly in its Gasoline Powered Fork Truck. One double wet plate Maxitorq controls forward and reverse directions . . . another double unit is for low and high speed. Gears are in constant mesh . . . shifting of gears is eliminated.

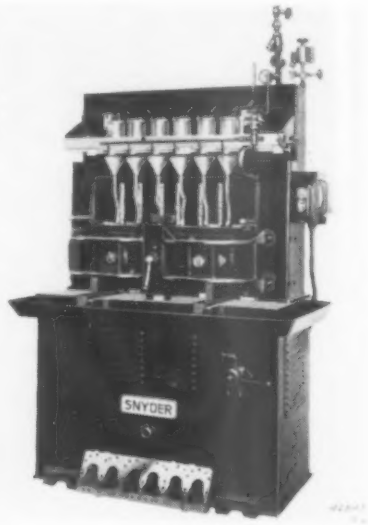
If your product or your machine requires clutches, the standard Maxitorq is well worth investigation. Shipped completely assembled on the body ready to slip onto a shaft . . . no tools required for assembly, adjustment or take-apart. Separator Springs keep discs apart in neutral, preventing drag, abrasion, heating. Capacities to 15 H.P. at 100 r.p.m., wet or dry.

Send for Catalog No. TE5

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

Volume Testing Machine

A special machine, designed and built by Snyder Tool & Engineering Company, tests automotive cylinder head volume at a production rate of 60 per hour at 80% efficiency. The cylinder head is clamped in the fixture by air-operated toe clamps which engage the four corners, and by a latch clamp which is manually positioned over the center of the part.



The operator opens a valve which fills a series of metering glasses, along the top of the machine, with compound-treated water. He then opens each glass and allows the liquid to pass into the cylinder head combustion chamber; this liquid, rising in the glass gages, registers the volumetric content of each combustion chamber.

Because air bubbles remaining inside the cylinder head would give an appreciably inaccurate reading, the liquid is brought into the combustion chambers in such a way that all air is displaced. At the completion of the metering cycle, liquid is drained into a tank and pumped up to a reservoir above the metering glasses. The machine can be operated satisfactorily by any available labor. **T-5-28**

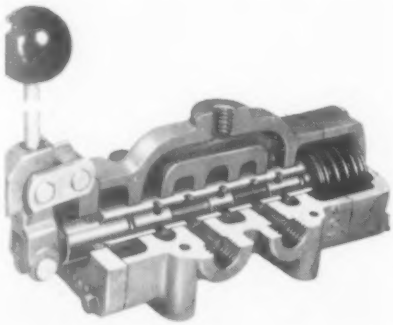
Die Slick for Die Casting

A new Lubricating Compound—Die Slick No. 4—developed by G. W. Smith & Sons, Inc., principally for lubricating the piston (ram or plunger) on cold-chamber die casting machines, is also said to be an excellent lubricant for ejector and guide pins on pressure die casting dies; and for use on all movable parts of permanent molds, such as, cores, pinions, slides and racks.

Being highly viscous, it is generally applied with brush or swab, but can be sprayed where necessary. Having extreme heat-resistive qualities, it is claimed to prevent all scoring and sticking of parts on which it is coated. Comparative tests indicate that it lasts two to three times longer than lubricants heretofore used for these purposes. **T-5-29**

4-Way Selector Valve

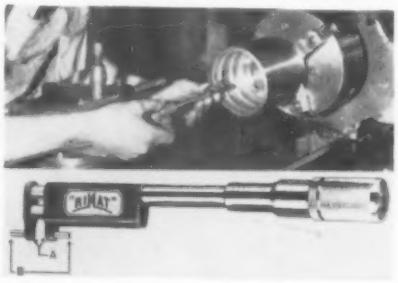
A new series of hydraulic 4-way selector valves for industrial use, by Adel Precision Products Corp'n, is designed for 1000 psi pressures for control of one double-acting cylinder, or two single-acting cylinders. A feature of this valve is the spool, which is completely balanced axially as well as radially so there is no possibility of spool movement caused by surge pressures in the reservoir return line. Of large diameter and precision machined, the spool assures maximum oil flow with a minimum pressure drop. A dirt-excluding shaft seal keeps foreign materials from working into the valve mechanisms.



The line provides a variety of models to meet all operating conditions: lever-operated for manual control; mechanically-operated for remote manual control; pilot-operated for remote hydraulic control; single treadle for foot control; solenoid-operated for remote AC or DC electrical control; and cam roller-operated for automatic control. Available in $\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$", $\frac{3}{4}$" and 1" pipe thread port sizes with flows of 32 gpm.

T-5-30

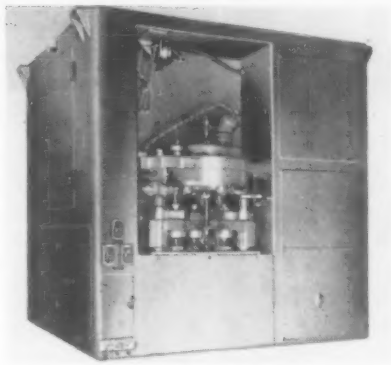
Duplex Micrometer



While designed principally for inside work, a new "Model L" Longitudinal Duplex Micrometer, added to the Rimat line by Richards Machine Tool Company, will take both inside and outside measurements of grooves and flanges on the inside of a bore. It is sufficiently small to reach into a hole or opening down to $\frac{1}{2}$". Measurements are easily readable while the instrument is held in place, marking a significant advance in micrometer design. External measurements are made between points "A", as shown in the photo, and internal measurements between points "B".

T-5-31

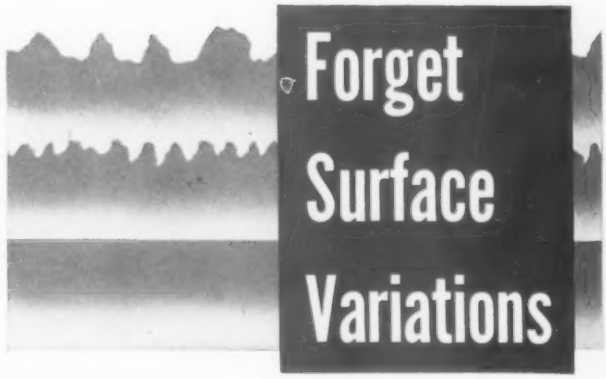
Hydraulic Assembly Press



A special **Hydraulic Machine**—Type HCP3-5, by the Agnew Electric Company—has been designed for assembly of one-piece spark plugs; however, it can also be adapted to progressive welding and forming of other products.

The machine incorporates a table, having 6 stations, which indexes 60° by means of a hydraulic motor, and all sequencing operations are performed hydraulically to provide against possibility of deviation from proper sequence. Pressures up to 8 tons are obtainable, and the replaceable and interchangeable components provide for "conversion" should this be desired.

T-5-32



MERZ NEW-MATICS ACCURATELY MEASURE I.D. OR O.D. . . . REGARDLESS OF SURFACE CONDITIONS

● Only MERZ *New-Matic* Measuring Machines enable you to obtain identical I.D. or O.D. readings—*every time*—on parts of like diameter . . . *regardless of surface variations.* In MERZ *New-Matics*, a synthetic ruby button contacts only the highest surface points. Unlike conventional gages—where compressed air directly touches *all* surfaces, high and low alike—MERZ *New-Matics* are unaffected by any surface variations.

For the same reason, MERZ *New-Matics* are the only air-actuated units capable of accurately gaging parts in which perforations or keyways have been machined. MERZ *New-Matic* Measuring Machines also permit accurate gaging to the extreme edges.

For full details on these and many other advantages of MERZ inspection equipment, write for free 20-page book on the *New-Matic* principle of measuring and sorting.

MERZ ENGINEERING COMPANY • INDIANAPOLIS 7, IND.

MERZ "Master" New-Matic Measuring Machine. Other New-Matic models for every inspection purpose.

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Here's a TOOL KIT that will save you a lot of TIME and MONEY

With this *MINUTE MAN* kit you can cut keyways *IN ONE MINUTE*

in **GEARS** **COLLARS**
CUTTERS ***PULLEY HUBS***
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MAIL THIS COUPON
Get the whole story on what this Kit does, how it works, how little it costs.

Kit contains everything you need to cut complete range of keyway sizes—precision hand broaches, slotted bushings, shims, keyway stock. Used with du Mont or other Arbor Press. Cut a few keyways and you've paid for the Kit.

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Please send me Descriptive Folder and Price List "C"
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ADDRESS .....
CITY .....
NAME & TITLE .....

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GREENFIELD, MASSACHUSETTS

New "Red Ring" Gear Shaver

Incorporating in one machine the many improvements in gear shaving developed over the past few years, the new "Red Ring" **Universal Diagonal**, by the National Broach & Machine Company, shaves by either the diagonal or conventional method to satisfy a very broad range of manufacturing requirements.

As an example of its versatility, the machine is said to handle any conventional shaving operation—i.e., where the gear is automatically reciprocated parallel with its axis across the cutter and automatically fed into the cutter vertically with each stroke. This is especially desirable for work gears with wide faces.

In addition, any gear being shaved conventionally can, at the same time, be given the elliptoid tooth form by rocking the table as it is being reciprocated. Degree of crowning, and the position of the crown, are both selective. Also, any type of gear may be taper shaved by locking the table at the correct angle for the taper desired.

All of the inherent characteristics of the Red Ring line have been retained—viz: the cutter is always located above the work gear to prevent damage should the latter be accidentally dropped when loading. **T-5-33**

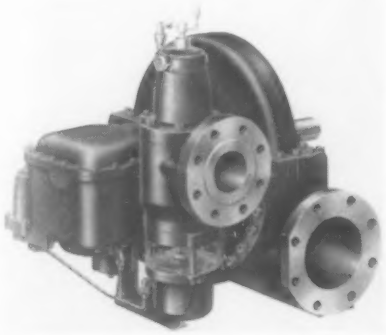
Transparent Protective Skin

Metal, wood and fabrics can be protected from corrosion and deterioration by a new transparent liquid "skin" recently introduced by the State Chemical Corporation.

Called Permacote, this protective coating can be applied by brush, spray or dip and forms a tough, transparent coating which remains permanently flexible and highly resistant to abuse, expansion and contraction from temperature changes. **T-5-34**

Mechanical-Drive Turbine

A new small mechanical-drive **Turbine**, designed as Type DP, with ratings existing from 10 to 1200 hp and with speeds from 1000 to 5000 rpm, and announced by General Electric's Turbine Divisions, is available in three single-stage frame sizes with a 16-inch, 20-inch, and 25-inch wheel.

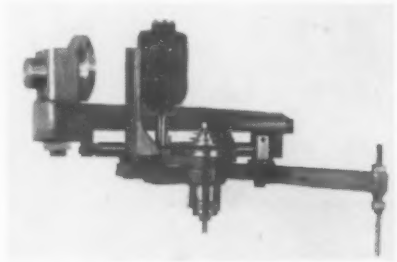


Embodying such features of large turbines as hydraulic governing for wider speed range and more accurate control, and pressure oiling of bearings to insure positive lubrication, it can be applied as a drive for pumps, compressors, fans, blowers, and similar equipment. Range of speed adjustment has been increased to 30 per cent, while speed regulation has been reduced to 6 per cent. More parts are enclosed, and the governing system is completely encased in an oil atmosphere to eliminate rusting on standby service.

Also, a new balanced valve design is used for the governing valve and the combined trip-throttle valve. With this design, less force is required to operate the valves, and a given size valve can handle larger steam flows. These valves are combined in one assembly. **T-5-35**

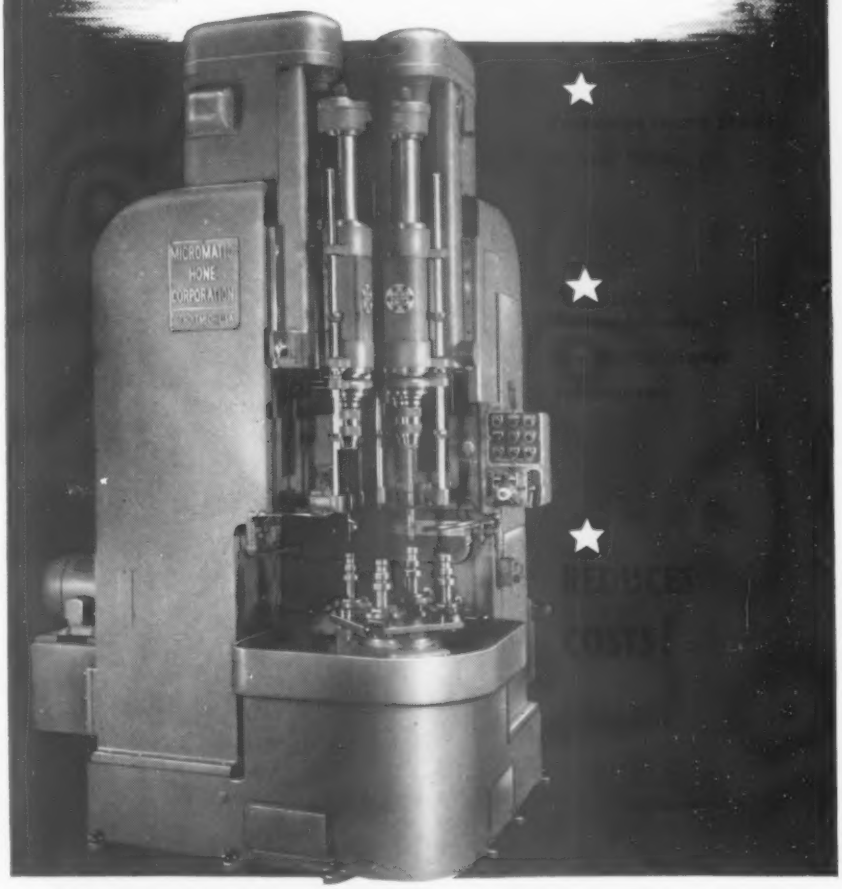
Control-Cut Multi-Graver

A new attachment, by the Auto Engraver Company, converts a milling machine to engraving, profiling or contouring operation, as well as to intricate marking on dies and molds. While designed as a 2 and 3 dimensional attachment, reproductions at 4:1 ratio is declared possible.



At 1:1 ratio it utilizes the feed of the miller, the possible 12″ area covered being governed only by the capacity of the miller itself. An area of 8″ x 16″ at 2:1, and 3½″ x 10″ at 4:1. A precision attachment, the **Multi-Graver** comes complete with draw-in bar and a standard engraver's taper collet. **T-5-36**

MEMO
Lets look into this
NEW machine
for heavy-duty multiple or progressive
MICROHONING



Micromatic now offers a new multiple spindle, unit constructed, Quill type machine with added power and control for removing more and more stock in less time from harder materials. Completely automatic, electronic control of uniform size within .0001 to .0003 inch in production.

Microhoning Machines, Tools, Fixtures and Abrasives

MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

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616 Empire Bldg., 206 S. Main St., Rockford, Ill.
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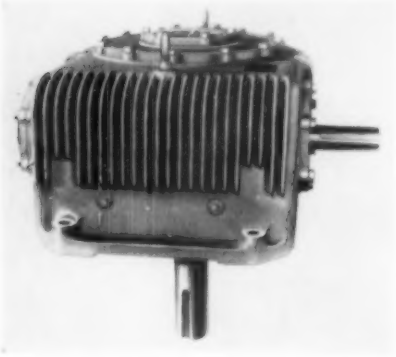
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

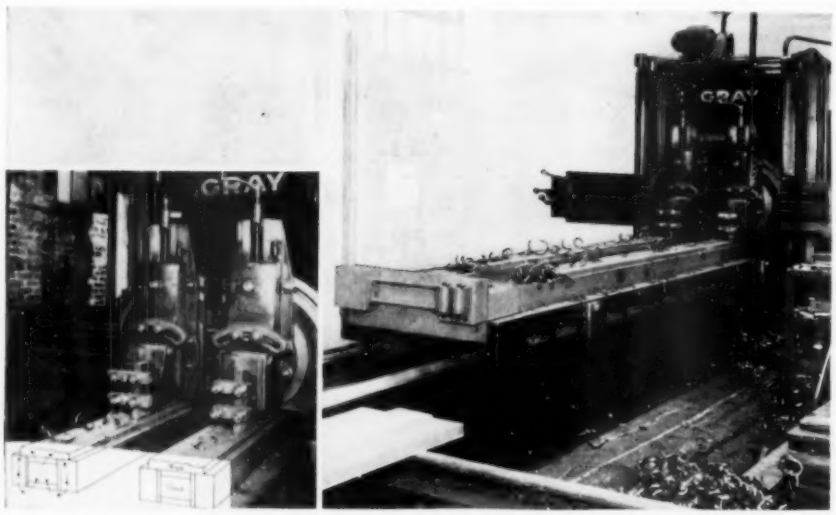
New Speed Reducers



The Cone-Drive Division, Michigan Tool Company, has added a standard series of 7" center distance speed reducers, Series 7700, in ten standard ratios ranging from 5:1 to 70:1, to its stock line of Heavy Duty **Right Angle Reducers.**

An intermediate size, the new series is available in three types: HU-7700, with pinion under the gear; HO-7700, with pinion over the gear; and HV-7700, with gear shaft vertical. All ratios and types also available with double extended gear shafts or double extended pinion shafts.

These 7" reducers have mechanical horsepower ratings ranging from 1.56 horsepower at 100 rpm for the 70:1 ratio to 94.2 horsepower at 2400 rpm of the pinion for the 5:1 ratio. The new 7" line of reducers will carry approximately 50% more horsepower than the 6" center distance Cone-Drive models. Thus, a 30:1 reducer in the 7" line will transmit 22.5 hp at 1750 rpm as compared with 15.8 hp for the six inch series. The same ratio on an eight inch center distance will handle 32.2 hp at 1750 rpm. **T-5-37**



Power-Grip Holding Provides Rare Possibilities For Lowering Planing Costs

The work illustrated above is planing shear blades, 18-feet long, two at a time, held with Power-Grip Chucks. On jobs of this type, requiring two mechanical settings, changing to Power-Grip Magnetic Holding accomplishes a reduction in floor-to-floor time representing an extremely favorable cost adjustment. And added to the time-saving factor is improvement of the quality of work resulting from the uniformity with which the entire length of the material is held down.

Power-Grip Chucks represent a modern magnetic holding technique offering broad possibilities of production improvement that can be effected immediately.

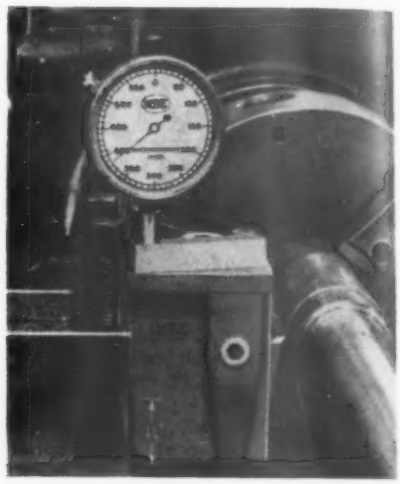
You can quickly learn the possibilities for any job by sending us prints and operating data, so we can submit a complete proposal for Power-Grip Holding.

ROCKFORD MAGNETIC PRODUCTS CO., INC.
1304 18th Avenue, Rockford, Illinois

Send for This Booklet

ROCKFORD POWER-GRIP CHUCKS

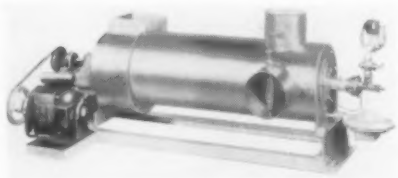
Machinability Tester



A three-component tool dynamometer, originally invented by Dr. George Schlesinger for ascertaining tangential, radial and feed forces when turning metals, has now been developed into a **Machinability Tester.** While widely used, currently, in a number of European countries, it has lately been made available for distribution in the United States.

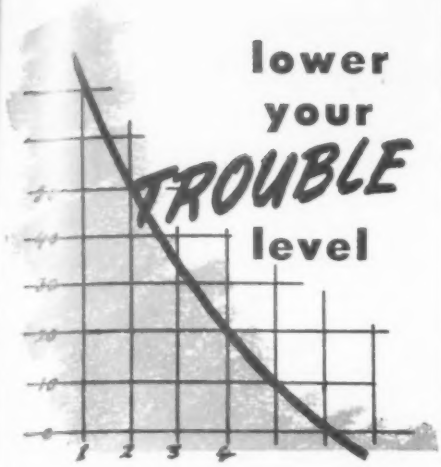
The Tester is applicable to metal cutting on engine and turret lathes, and automatics, and will indicate the most efficient cutting conditions (or the reverse) so that users may base operations on a known quality. **T-5-38**

Industrial Heater Unit



A new **Midget Utility Air Heater,** of improved design, and now available as a complete package unit from Gas Appliance Service, Inc., includes fan, motor, drive, safety devices, and temperature controller.

Direct fired for maximum efficiency, the unit is said to be ideal for heating drying rooms and small industrial ovens, and applications include baking on lacquers and enamel on metal ware, or varnish on coils and armatures. The unit has a heating capacity of 125,000 BTU per hour and is suitable for temperatures up to 350° F. **T-5-39**



D. A. Stuart Oil Co. Can Do Jobs Like This for You

". . . Stuart's SOLVOL was put in on a trial basis for milling high carbon alloy steel. High-speed alloy cutters were used and it was found that SOLVOL increased the cutter life 3 to 4 times over what they had been getting."

". . . on switching to SUPERKOOL, operator reported less mist from the precision grinding machine . . . production increased to 200 pieces . . . finish improved 2 to 4 micro inches . . . foreman and lubrication engineer well pleased."

"Stuart's SOLVOL was put in on a trial basis for use in milling machines on high carbon alloy steel. High speed alloy cutters were used and it was found that SOLVOL increased the cutter life three to four times over what they had been getting. This customer is well pleased with SOLVOL and will continue to use it in the future on these machines."

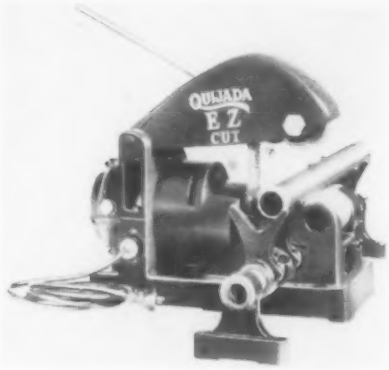
The above case studies are typical of results being secured throughout industry with Stuart oils correctly applied to the job. D. A. Stuart Oil representatives are not miracle workers, but they have back of them a tremendous fund of experience and technical assistance. If you are having trouble due to cutting oils you can count on them to minimize the troubles. Write for D. A. Stuart booklet, "Cutting Fluids for Better Machining."

Stuart Oil Engineering Goes with Every Barrel

D.A. Stuart Oil Co. EST. 1865 LIMITED

2727-49 So. Troy Street, Chicago 23, Ill.

New Pipe and Tubing Cutter



Compact in design and fully portable, a new high speed ("E-Z Cut") **Pipe and Tube Cutter**, by the Quijada Tool Co., Inc., simplifies and speeds up pipe and tube cutting operations in pipe diameters ranging from $\frac{3}{8}$" to 4". Cutting cast iron pipe within the same range is also possible with this new cutter, which incorporates a ball-bearing mounted cutter wheel which is easily removed for sharpening.

An automatic trip-switch starts cutting operations when the cutter wheel contacts the pipe and automatically stops when the cut is finished. Adjustable roller yokes provide necessary support for the pipe, yet permit free rotation. **T-5-40**

INCREASED PRODUCTION AT NO EXTRA COST

10 HOURS PRODUCTION IN 8 HOURS WORKING TIME IF YOU USE A FAST CUTTING MANHATTAN WHEEL ON YOUR PORTABLE TOOL

It is false economy to consider wheel cost alone. The number of production units per wheel is not the only cost factor. More important is the number of units per day! Today's higher cost of man-hours demand increased output. Send for a MANHATTAN field engineer. He will show you how to increase production through the selection of a fast cutting MANHATTAN grinding wheel.

RUBBER BOND **RESINOID BOND**

Ask about the new V.D.B. (Vibration Dampener Bushing) Wheel. Reduces fatigue and strain on operator.

ABRASIVE WHEEL DEPARTMENT

RAYBESTOS MANHATTAN

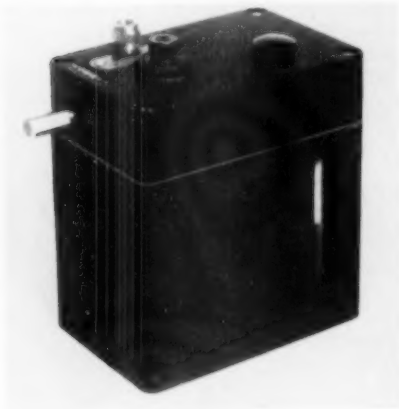
RAYBESTOS-MANHATTAN INC.

Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

Automatic Lubricator

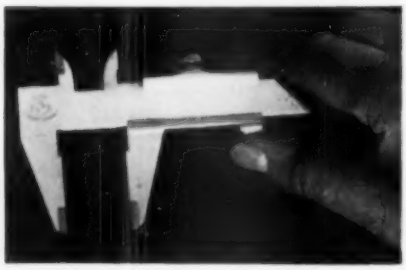
Designed for installation within small machines, the new Type "M" Lubricator, by Bijur Lubricating Corporation, effectively oils up to 100 bearings with measured regularity. Automatically driven by the machine, this cyclic unit develops an average discharge pressure of 40 pounds psi and may be adjusted to discharge from 2.5 to 5.5 cubic centimeters at each pump impulse.



Used in conjunction with a meter-unit distribution system, this completely automatic unit delivers small quantities of oil under accurate control of all bearings, gears and way surfaces of a machine at pre-determined intervals. The lubricator is driven from a rotating machine shaft, either directly or by means of a belt or gear drive of suitable ratio. Power requirements are said to be negligible, being of the order of .001 horsepower. **T-5-41**

Rustless Vernier Caliper

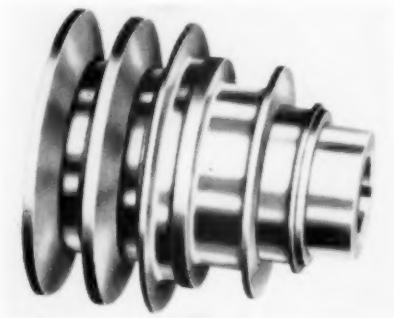
Somewhat different from the ordinary homecraft vernier is a rustless chrome Vernier Caliper, providing measurements from 0" to 6" in thousandths and 64ths for outside, inside and depth dimensions. A Swiss tool, manufactured for the George Scherr Company, it is provided with knife edges for measuring the root diameter of threads, with points for accurate dividing.



Blade and jaws are hardened, and the slide is of rustless chrome, so hard in comparison with the bar that wear between the two is negligible. The jaws have optically lapped finishes, with measuring surfaces claimed to be accurate to .000008" and guaranteed to be parallel. **T-5-42**

Clutch Unit for Twin V-Belts

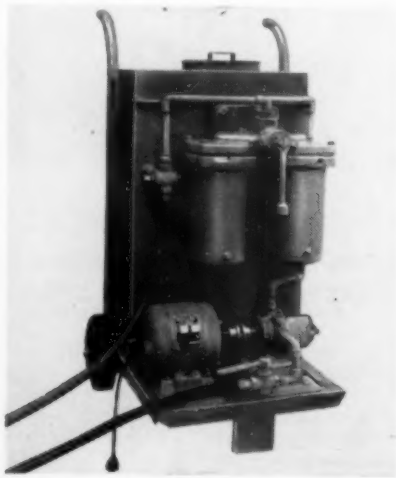
Designed for twin V-belts, a new addition to the "Ball-Lok" line of V-belt clutches provides smooth starting on heavy loads, high speed operation, equalized belt pressure, instant release and elimination of belt grabbing. The unit is suited to industrial drives as well as to other requirements.



When the clutch is set for idling, the belts ride on free-turning bearings of double slip-ring design. When engaged for driving position, the belts are gripped and ride up on axially-moved pulley sidewalls. The twin-belt models are available in ratings 5 to 10 HP in shaft size ranges 1" to 1¼". **T-5-43**

Portable Oil Flusher

A new Lubey portable Oil Flusher, by the Fox River Tool Company, permits internal cleaning of machinery with a high pressure nozzle jet by means of which organic solvents, kerosene or lubricating oil can be shot through inspection holes or clean-out openings. A safety control device reduces the flow to a gentle flushing stream, if desired.



Residue may be drawn out through drain connections, or by suction hose, and collected in a filter. The flushing solvent is thus cleaned and may be recirculated until the parts are clean. The unit may also be used as a simple lubricating oil circulating system, and heaters or coolers may be as optional equipment, although an extra. **T-5-44**

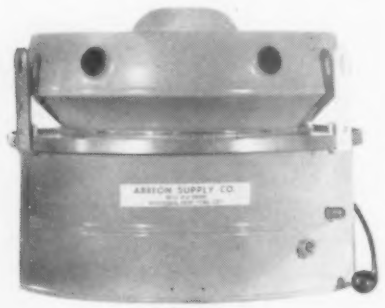
Double-Action Jig-Vise

A new pneumatic, double-action Jig-Vise, by the Deublin Company, supplies a consistent clamp for repetitive work to be drilled, filed, ground, polished, or assembled. Solidly constructed of cast iron, cast aluminum, and stainless steel, with all operating parts completely enclosed, the open front design of the tool facilitates and speeds the setting and removal of work from any of the three sides. It also permits work of a wide variety of shapes and sizes to be handled.

A double-acting air cylinder requires but one air line for positive power in either direction, and the "on and off" air control valve is adaptable to either left or right hand manual operation, or to automatic use. With the addition of a valve in the air line, clamping pressure can be adjusted from 0 to 10 times line pressure; thus the tool can handle work of heavy sectional material as well as thin walled plastics. With air doing all the work, operator fatigue is reduced to the barest minimum. **T-5-45**

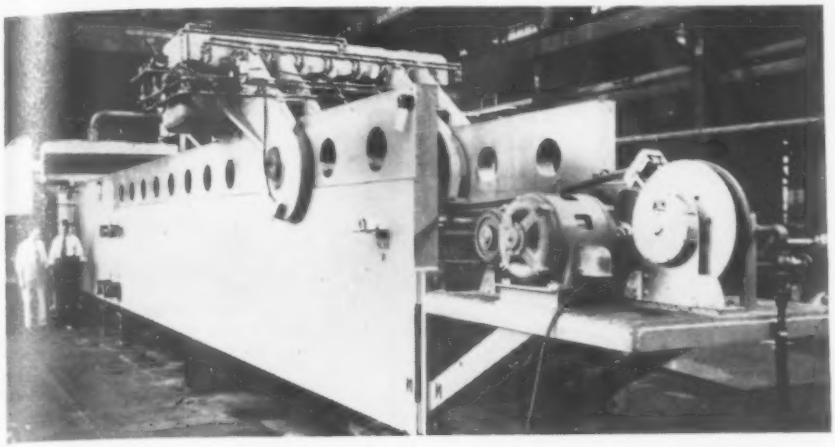
New Industrial Humidifier

A new Humidifier for industrial uses, by the Walton Laboratories, Inc., requires neither steam, pump nor compressor for its operation. The unit is entirely self-contained, noiseless in operation and is said to atomize moisture in a vapor form finer than cigarette smoke.



The unit is equipped with brackets, to hang from the ceiling, and may be connected direct to the main water line. No return pipe is needed. Vaporization capacity is one gallon or none per hour, and the operating cost is said to be around 50 cents per month. **T-5-46**

Large Hydraulic Plate Stretcher-Leveller of New Design

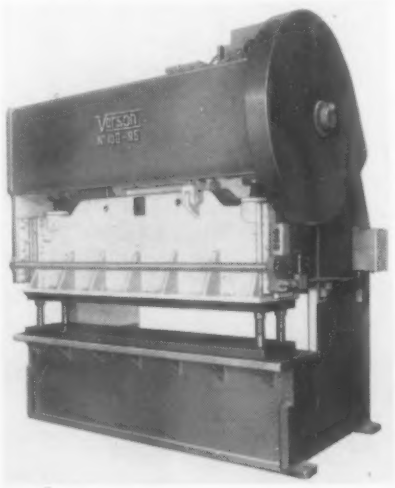


A **Stretcher-Leveller** of special design, built by Hydro-press, Inc., and believed to be the largest of its kind, is of the self-contained oil hydraulic type, has a capacity of 825 tons and is adapted to accommodate plates or sheets up to 100″ wide. The maximum length of the plates is 33′ and the minimum length 7′.

Two gripheads are provided of which one is actuated by the hydraulic stretching cylinder, while the position of the other one is adjustable to compensate for the varying length of the plates. Operation is effected by remote control from the operating panel, with pressure adjustment over a wide range provided for handling thinner and narrower plates at required accurate pressure. **T-5-47**

New Gang Press by Verson

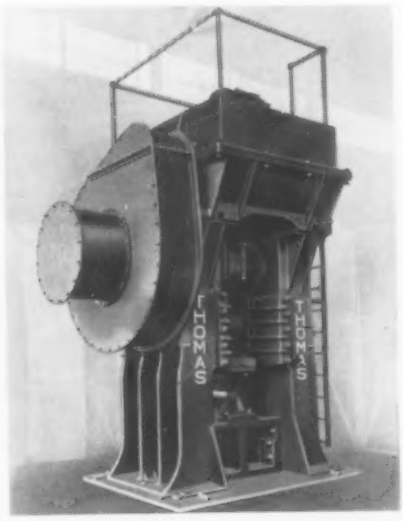
To bridge the gap between press brakes and large, heavy blanking presses, The Verson Allsteel Press Company has developed a line of **Gang Presses** ranging in capacities from 100 tons to 350 tons in bed lengths from 72″ up.



These presses are especially designed for blanking, forming, punching, shallow drawing, and multiple operations whereby a series of operations may be done in one handling to effect real manufacturing economies. Control is by means of electrical push buttons—hand or foot operated—and a selector panel for inching, one stroke, or continuous operation as desired. **T-5-48**

Improved Billet Shear

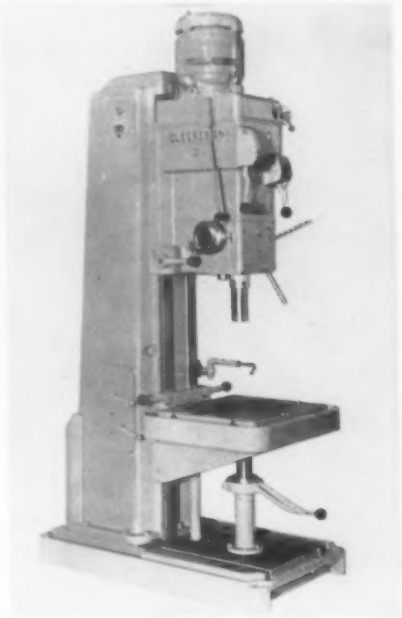
The Thomas Machine Manufacturing Company, announces a **Billet Shear** line of advanced design in which all gears and the motor drive are overhead and all moving parts are enclosed. This design results in floor space economy of approximately 50 percent over conventional shears; greater accessibility and a heightened factor of operator safety.



Construction features of the 1200-ton machine pictured include all cast steel housing; an air operated multiple jaw type clutch; and cast steel herringbone cut gears running in an oil bath. **T-5-49**

New Cleereman Drill

A new Model 325 Single Unit **Sliding Head Drilling Machine**, by Bryant Machinery & Engineering Company, combines extreme sensitivity with rugged construction and is adapted to an exceptionally wide variety of manufacturing operations. Construction has been simplified and operating facility increased.



Features include a fully inclosed single unit sliding head which houses the spindle and feed mechanisms, motor and spindle speed transmission. All electrical equipment and controls are normally on the sliding head and concentrated within a small area for operator convenience. The machine has single lever functional control with 6 geared spindle speed changes on one lever, and 4 feed rates on another. Other features are direct action feed clutch engagement, positive feed depth stop and a short, stiff sensitive spindle of great rigidity.

Standard accessories, among several of wide application, includes a manually indexed, 4-position Turret Feed Trip, which can be arranged for automatic cycle control for tapping. Conveniently located pick-off gears for varying the feed range or providing tap leads are available. **T-5-50**

Drill and Saw Lubricant

A new Drill Lubricant put out by Shell Oil Company, is so packaged that a rotating drill can be inserted through the top cover into the lubricant. An adjustable bottom keeps the lubricant at the top of the container.

The Saw Blade Lubricant, which can be attached to a band saw guard, provides for automatic, self feeding lubrication. Both of these lubricants, which were interestingly demonstrated at the recent (ASTE) Tool Engineers Industrial Exposition, Cleveland, are designed to increase cutting speeds and to extend tool life. **T-5-51**

Use This Coupon for Complete Information On Tools of Today Items Featured This Month

For your convenience, a key number follows the announcement of each product reveiwed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
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Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-5-1 T-5-2 T-5-3 T-5-4 T-5-5 T-5-6 T-5-7 T-5-8 T-5-9 T-5-10 T-5-11
T-5-12 T-5-13 T-5-14 T-5-15 T-5-16 T-5-17 T-5-18 T-5-19 T-5-20 T-5-21 T-5-22
T-5-23 T-5-24 T-5-25 T-5-26 T-5-27 T-5-28 T-5-29 T-5-30 T-5-31 T-5-32 T-5-33
T-5-34 T-5-35 T-5-36 T-5-37 T-5-38 T-5-39 T-5-40 T-5-41 T-5-42 T-5-43 T-5-44
T-5-45 T-5-46 T-5-47 T-5-48 T-5-49 T-5-50 T-5-51

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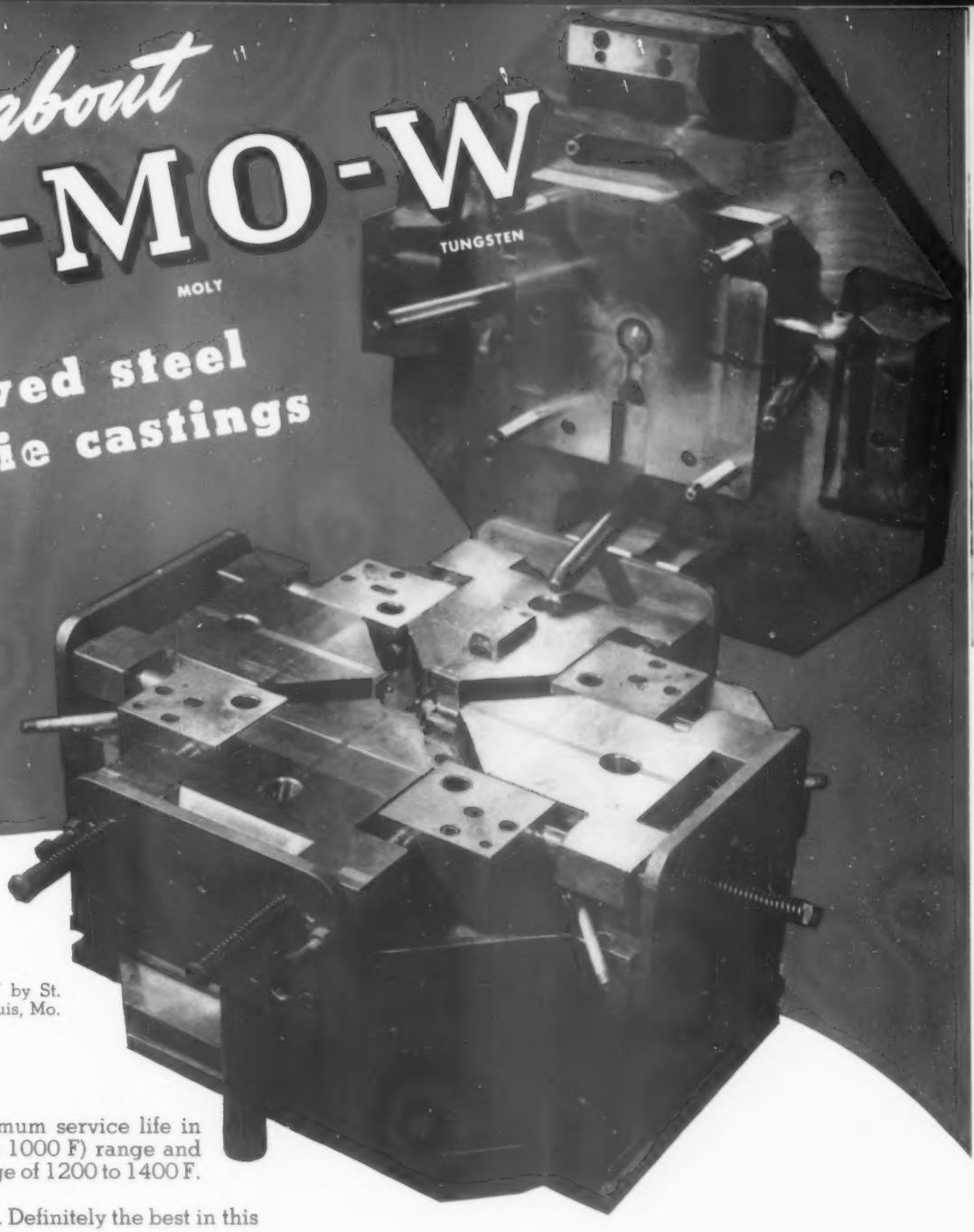
★ SERVING INDUSTRY WITH TOOLS, DIES, JIGS, FIXTURES, SPECIAL MACHINES AND MACHINE WORK . . . FOR NEARLY FORTY YEARS . . . WRITE FOR DESCRIPTIVE FOLDER.
Something worth talking about!

Facts about CR-MO-W

CHROME MOLY TUNGSTEN

A proved steel for die castings



Casting dies made from Cr-Mo-W by St. Louis Die Casting Company, St. Louis, Mo.

APPLICATION: For maximum service life in the low-temperature (600 to 1000 F) range and for normal service in the range of 1200 to 1400 F.

MACHINABILITY: Good. Definitely the best in this respect of all hot-work steels.

TOUGHNESS: Very good. Resists severe mechanical shocks and high platen pressures.

RED-HARDNESS: Good. Has high resistance to heat-checking.

DISTORTION: Excellent resistance to distortion. Ideal for intricate shapes and accurate size.

HARDNESS: In annealed condition, 217 Brinell. After heat-treatment, 40 to 50 Rockwell C.

HEAT-TREATMENT: After machining to contour, preheat to 1350 F. Harden at 1850 F, followed by air-quench. Temper from 1050 to 1150 F. Use neutral atmosphere to prevent surface-carburization.

Analysis:	Carbon	Chromium	Moly	Tungsten	Silicon
	0.33	5.00	1.65	1.55	1.05

These facts provide a quick character analysis of Cr-Mo-W. This well-balanced grade of die steel is well worth your study, for it is widely used in the die-casting industry to meet many different requirements.

There is still more to be told about Cr-Mo-W. Phone your nearest Bethlehem sales office or tool steel distributor. Or drop us a line at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

CR-MO-W . . . one of Bethlehem's Fine Tool Steels

This—

is the business end—

TAKE CARE OF IT

ON A

DETROIT

TAP RECONDITIONER

You can put worn taps right back in "good as new" shape with the DETROIT 4 in 1 tap reconditioner. It's like getting an almost unlimited supply of NEW TAPS for next to nothing, for this reconditioner is remarkably low in price—pays for itself in short order. It chamfers, grinds flutes (from 2 to 6), spiral points taps where required and polishes the points. Handles taps up to 1½ inch diameter.

For complete information write or wire for Bulletin #DTR-4.

DETROIT

TAP & TOOL CO.

8432 BUTLER AVE. • DETROIT 11, MICHIGAN

The Home of "M-11" CHROME-COBALT HSS TAPS, THREAD MILLING CUTTERS & THREAD GAGES

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
How can proper selection and application be assured?

ANSWER BY
CARBORUNDUM
TRADE MARK

To realize maximum efficiency from even the highest quality abrasives, it is essential that attention be directed to their correct use. For this specific purpose, The Carborundum Company has established a specialized group of product application engineers.

This group studies, appraises and tabulates abrasive applications. New improved methods and better abrasive products are often turned up. CARBORUNDUM engineers are also called in to help in selecting the best abrasives to use for specific jobs and in specifying their application. The end result is better grinding, sanding and finishing at lower overall cost . . . another reason pointed to in preferring abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
TRADE MARK

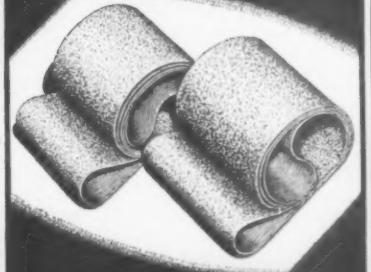
BONDED ABRASIVES
COATED ABRASIVES
ABRASIVE GRAINS AND FINISHING COMPOUNDS

Tool Room sticks and stones that cut fast . . last long . . and hold their form.

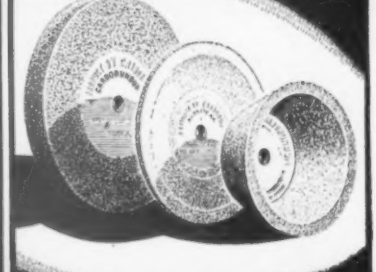
A variety of rolls for a wide range of uses.

"Carborundum" is a registered trade-mark which indicates manufacture by The Carborundum Company.

Abrasive Grains for pressure blasting.



A Coated Abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM.

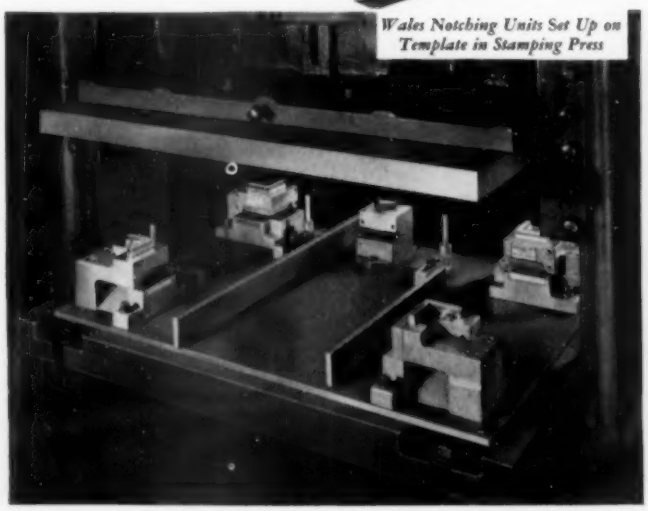
WALES CATALOG ON NOTCHING *just off the press*

● Cover illustration shows punching and notching in the same operation with Wales Equipment. Note the work in foreground.

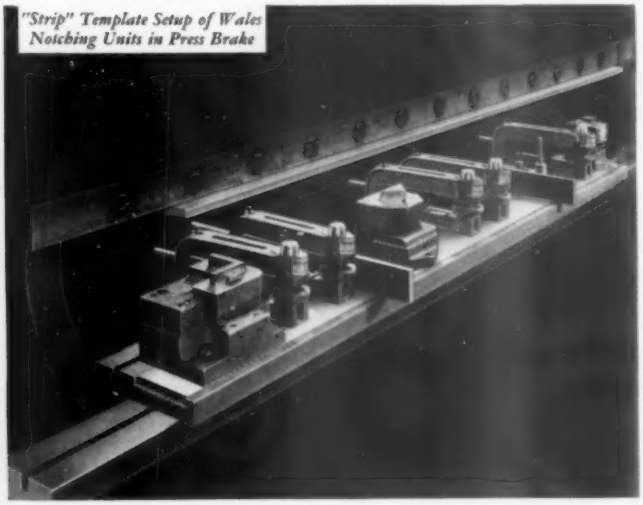
● Wales Patented Notching Units have introduced economies and efficiencies never before available to the metal-working industry. These advantages are fully-illustrated in this new functionally-colored catalog. The Wales Equipment story is too big to tell on this page so write for your copy of this CATALOG N.

WALES-STRIPPIT CORPORATION
George F. Wales, President
393 PAYNE AVENUE, N. TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA, LTD.
HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment



Wales Notching Units Set Up on Template in Stamping Press



"Strip" Template Setup of Wales Notching Units in Press Brake

What is Your I.Q. on Kennametal?

Q. How hard is Kennametal?

A. The Rockwell A hardness of the various metal-cutting grades ranges from 90.3 to 93.1.

Q. How is hardness determined?

A. Usually with a Rockwell tester which measures the indentation made with a diamond penetrator under a 60 Kg load, and indicates the value on a calibrated dial.

Q. Is hardness an absolutely definite property?

A. No, because hardness is not a fundamental property of materials and may be defined in many ways, with different tests employed. The values obtained by methods of testing are the resultant of several properties, such as resistance to deformation, and the relative magnitude will vary greatly with the method of measuring penetration and properties of the material. The Rockwell test is, however, a convenient means of comparison.

Q. How does the hardness of Kennametal compare with that of steel?

A. The maximum for heat-treated steel is 85 Rockwell A—much less than the "softest" Kennametal grade.

Q. Does this "tell the whole story"?

A. No, because the figures do not adequately express the greater effectiveness and durability of Kennametal in use, since a few points of difference at the upper end of the Rockwell scale are more important than the numerical value indicates.

Q. What does the Rockwell test fail to show when made on Kennametal?

A. It is more a measure of the amount of binder metal present, and the state of subdivision of the carbide particles than their actual hardness,which is between that of the sapphire and diamond by scratch test.

Q. Is hardness the best measure of wear resistance?

A. No. Composition and internal structure are more important.

Q. Does hardness alone indicate the value of Kennametal?

A. No. To be mechanically useful a cemented carbide must combine hardness with strength and resistance to wear, which result from proper chemical composition and physical structure.

Q. Why do the several grades of Kennametal differ in hardness?

A. Machining requirements vary with the material to be cut, and the type of operation. For heavy cuts a stronger composition is required than for light or precision cuts, and some materials are more abrasive than others. To obtain needed strength, more binder metal is included and the composition altered, which lowers the hardness somewhat. However, even the hardest grades of Kennametal have unusual strength.

Q. How consistent is the hardness of each Kennametal composition?

A. The variation is nil within the limits of accuracy of testing methods. This holds good for tests on different areas of individual specimens, and on various specimens, of regular production.

Q. What is the significance of this hardness uniformity?

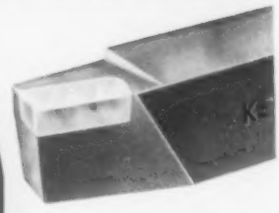
A. It has been definitely determined that consistency in hardness indicates uniformity in other distinctive properties of Kennametal, particularly high transverse rupture strength.

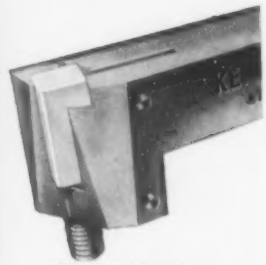
Q. What assures this condition?

A. A sound, uniform physical structure is produced by distinctive processing throughout all stages of manufacture, and precise scientific methods of control.

Typical
KENNAMETAL TOOLS

WAYS TO SAVE
by using
KENNAMETAL
TOOLING
to Increase Output of Metal Cutting Machines


STYLE BR


STYLE 11SK

STYLE 11H

STYLE SVG

Your machines are only as efficient as the cutting tools you use. It's good, sound judgment to invest a few extra pennies in long-lived Kennametal tools that can turn out up to five times as much as high speed steel tools on the same machine in the same time. Here's what you can gain by using Kennametal tools:

—**MACHINE TOUGHER, HARDER METALS**
Steel-cutting Kennametal tools cut steels in the hardened state; often eliminate need for annealing and rehardening.

—**INCREASE CUTTING SPEEDS UP TO 1000%**
Kennametal lets you convert electric power into cuttings or chips in the least possible time.

—**REDUCE MACHINE DOWN TIME**
Kennametal cuts within tolerance from 5 to 20 times longer; reduces machine down time required to change tools.

—**LOWER TOOL COSTS**
Durable Kennametal is the lowest-priced tool material when cost is measured in pieces per grind and pieces per tool.

—**MINIMIZE GRINDING**
Kennametal wears longer; requires fewer trips to grinding room for sharpening. New mechanically-held tools simplify procedure—no steel to grind.

Kennametal is made in various steel-cutting grades, each containing $WTiC_2$—the distinctive ingredient that prevents excessive cratering which destroys ordinary tools; and in two cast-iron cutting grades—K6 for heavier, roughing cuts, and K8 for fine finishing and boring.

Ask our field representative to suggest the best Kennametal tooling—the right grade, the right tool—for each of your jobs.

Tool Blanks
Hundreds of sizes
in all popular grades

KENNAMETAL Inc.
Latrobe, Pa.

Manufacturers of
Superior Cemented Carbides
and Cutting Tools That
Increase Production

PRECISION MACHINES PM PARKER • MAJESTIC

Since 1907, the name of Parker has been a part of the progress of the automobile industry.

In 1915, Parker introduced the basic principle of ball bearings in grinding manufacture—a major advance in grinding which was unknown at that time.

A few years later the Parker Ball Bearing was patented to meet high speed and precision requirements and has been in use ever since.

Further research and engineering development brought forth the well-known Parker Majestic External and Internal Grinding Machines, each machine representing a great advance in simplicity of operation and precision.

The latest tooling development of the company is the Parker Majestic No. 2 Surface Grinder that provides new accuracy and flexibility for small grinding operations.

These many products of Parker Majestic will continue to serve the great automotive industry in the future, keeping pace with its demands for speed, accuracy and dependability.

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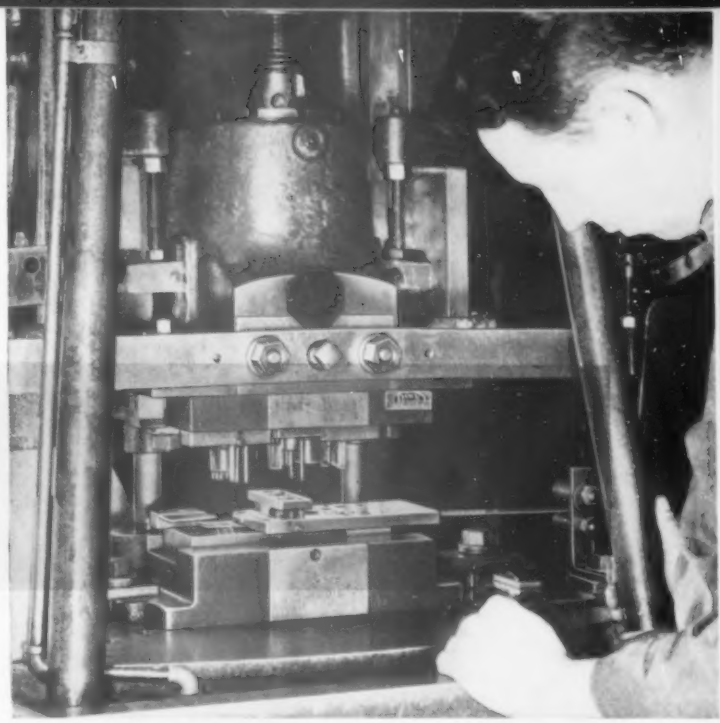
MAJESTIC TOOL AND MANUFACTURING COMPANY

147 JOS CAMPAU • DETROIT 7, MICHIGAN

•7200 stainless steel stampings per hour—

•tolerances held within 0.002" ——

...using DANLY STANDARD PRECISION DIE SET



Sustained operating precision of die set reduces die wear...produces 200,000 stampings per grind

Inherent accuracy in Danly Die Sets permits taking full advantage of the die maker's precision under actual press operating conditions. As a result, close tolerances may be held and tool life is substantially increased.

In the stamping operation shown, stainless steel parts for electrical instruments are pierced, formed and blanked in an intricate progressive die. Tolerances are extremely close, and finished parts must pass rigid gage inspection.

Stampings are produced at a rate of 120 per minute. At this high speed, a tolerance of 0.002 in. is held on inside and outside diameters and the distance between the bent arms. Danly Die Set accuracy is a major factor in maintaining punch-and-die relation, resulting in production of 200,000 parts between grinds.

DANLY ENGINEERING SERVICE—Use Danly Die Sets to insure the same close precision, high production and long die life on all of your press work. Consult our Engineering Dept. for helpful recommendations on die sets—large or small, standard or special—for *any* type of press operation. (No obligation.)

DANLY NATION-WIDE ★ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick delivery of any standard die set to your specifications.

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- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan Ave., N. W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommon Metals & Supply Co., 4890 S. Alameda
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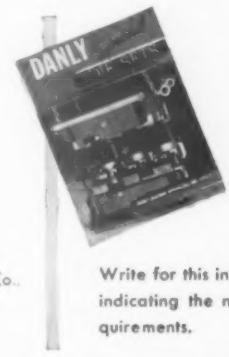

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DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL

MECHANICAL PRESSES AND PRESS EQUIPMENT

precision built...

Hanna valves

your practical answer to exacting control problems . . .

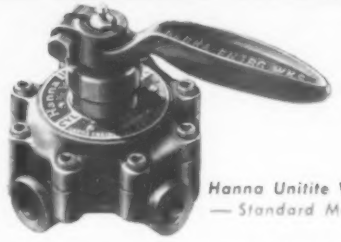
. . . in air and hydraulic equipment!

hand operated Unitite valves

. . . quick-acting, packless, permanently tight!

You're assured of excellent, long-term service with Hanna Unitite Valves. Their trouble-free performance is a reflection of proved design and precision manufacture, the trademark of all Hanna products.

Unitite Valves are suitable as either 3-way or 4-way valves, operating at air, oil or water pressures up to 250 p.s.i. for the ⅜", ½", and ¾" sizes . . . up to 150 p.s.i. for the 1" size . . . and up to 100 p.s.i. for the 1¼" size. Three styles—for standard mounting, column mounting or manifold mounting—are available.



Hanna Unitite Valve — Standard Mount

1-4" Unitite Jr. valves

. . . for tubing and light piping!

Hanna ¼" Valves control air, oil or water pressures up to 500 p.s.i. They are precision-made, packless valves with a number of features to make them highly practical for exacting control in tubing and light piping installations, small air and hydraulic equipment and as pilot controls for larger valves.

The control lever, designed for most efficient use, requires only 80° movement to effect a complete reversal. Hanna ¼" Valves are 4-way but can be made 3-way, simply by plugging one port. Three models—column mount, standard mount and manifold mount—are available.

Hanna ¼" Valve — Standard Mount

foot operated valves

. . . for quick, effortless control!

Available in ⅜", ½", ¾" and 1" pipe sizes, Hanna Foot Valves are ideal for applications where it is desirable to have the operator's hands free for handling material. They permit greater production with increased operator efficiency.

Single-pedal and double-pedal models, for pressures up to 250 p.s.i., are available for use with double-acting air and hydraulic cylinders. Made of highest quality materials, they offer a long life of efficient, effortless valve action.

Hanna Foot Valve

speed control valves

. . . regulate piston speed in two directions!

Hanna Speed Control Valve

For use with air or hydraulic cylinders, Hanna Speed Control Valves regulate inflow and outflow of either air or oil independently to and from one side of piston. Valves are installed between operating valve and either one or both ends of a cylinder. One valve will control piston speed in two directions. For air cylinders, two valves are desirable. In hydraulic cylinders only one is needed.

Speed Control Valves are available in standard pipe sizes: ¼", ⅜", ½", ¾" and 1". They operate with pressures to 250 p.s.i. for air cylinders and 1,000 p.s.i. for hydraulic cylinders.

Send for Bulletin 235 for details on all Hanna Valves

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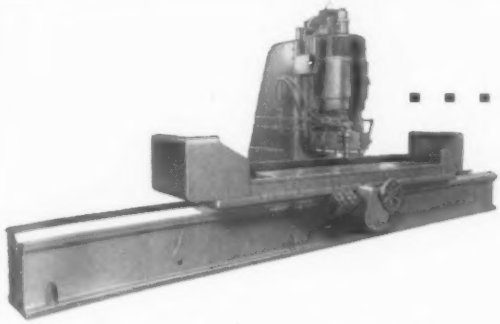
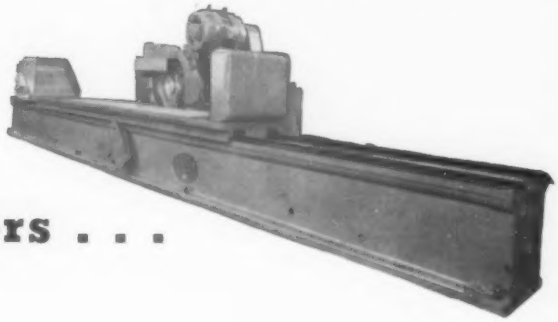
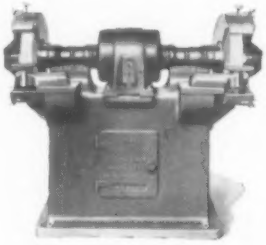


. . . for vertical surface grinders



for horizontal face grinders . . .



. . . for floor stand grinders

for buffing lathes . . .

. . . for cut-off machines

for Buxite tool grinding wheels . . .

(the hardest cutting surface for grinding carbides)

If you want authentic engineering information, Bridgeport equipment and wheel engineers have the help you need. Draw on their long, practical experience. Your inquiry will have prompt and authoritative attention.

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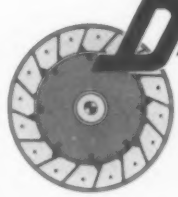
1300 West Broad Street **Stratford, Connecticut**



Bridgeport
FIRST in Grinders

HORIZONTAL FACE GRINDERS, VERTICAL GRINDERS,
CUTLERY GRINDERS, BUFFING LATHES, KNIFE GRINDERS,
FLOOR GRINDERS, CUT-OFF MACHINES, BUXITE ABRASIVE WHEELS

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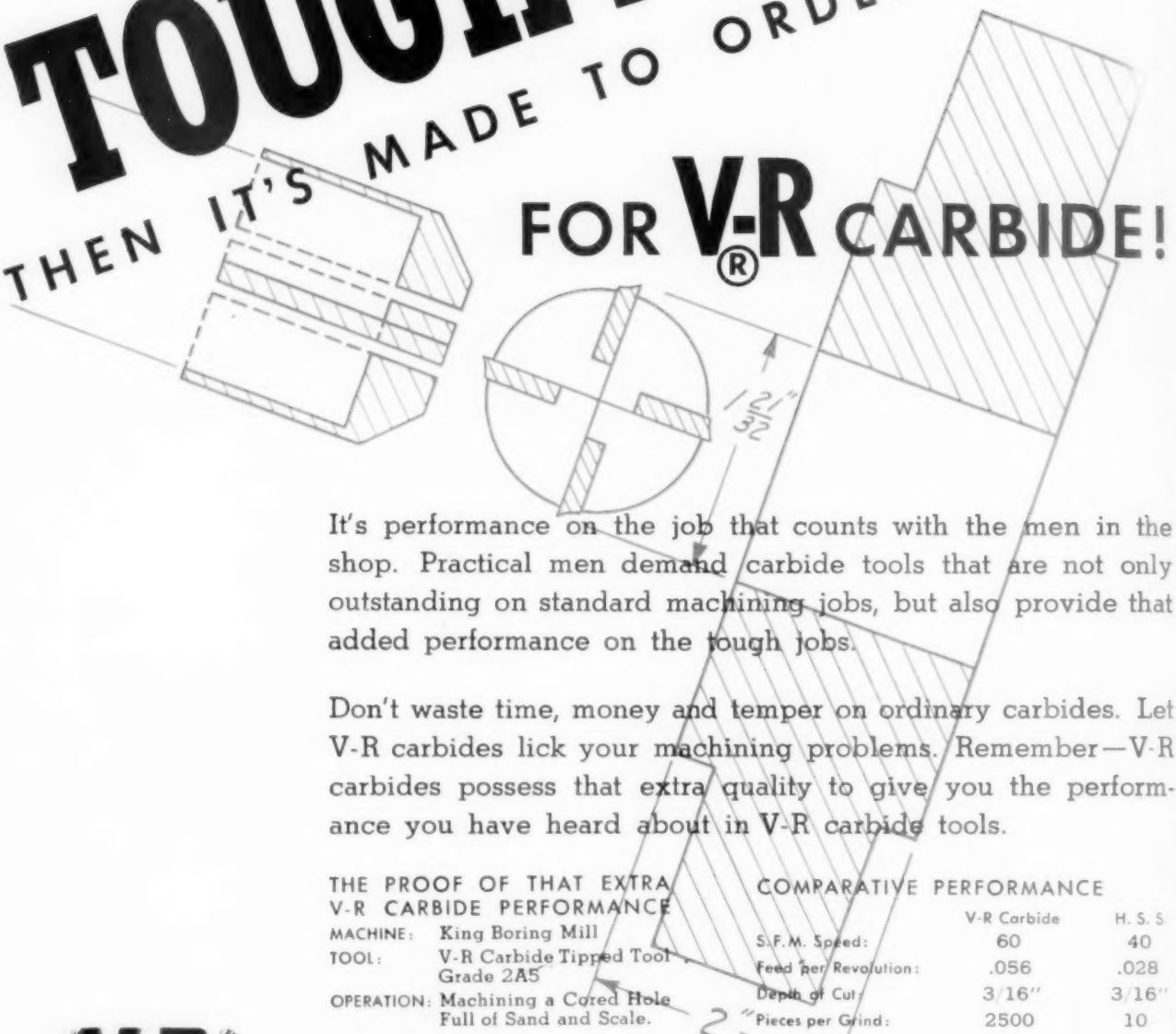
THEN IT'S MADE TO ORDER FOR V-R® CARBIDE!



It's performance on the job that counts with the men in the shop. Practical men demand carbide tools that are not only outstanding on standard machining jobs, but also provide that added performance on the tough jobs.

Don't waste time, money and temper on ordinary carbides. Let V-R carbides lick your machining problems. Remember—V-R carbides possess that extra quality to give you the performance you have heard about in V-R carbide tools.

THE PROOF OF THAT EXTRA V-R CARBIDE PERFORMANCE

MACHINE: King Boring Mill
TOOL: V-R Carbide Tipped Tool Grade 2A5
OPERATION: Machining a Cored Hole Full of Sand and Scale.

COMPARATIVE PERFORMANCE

	V-R Carbide	H. S. S
S.F.M. Speed:	60	40
Feed per Revolution:	.056	.028
Depth of Cut:	3/16"	3/16"
Pieces per Grind:	2500	10

REMARKS: 60 SFM is top speed of the machine. Little tip wear apparent at end of run. Another 2500 pieces could be run before grinding would be necessary.

V-R

KEEP UP TO DATE ON V-R CARBIDE TOOL GRADES AND THEIR APPLICATION! Write or call your nearest Vascoloy-Ramet Field Engineer for information about V-R carbide's outstanding performance on stainless steel, steel alloys, non-ferrous and non-metallic applications.

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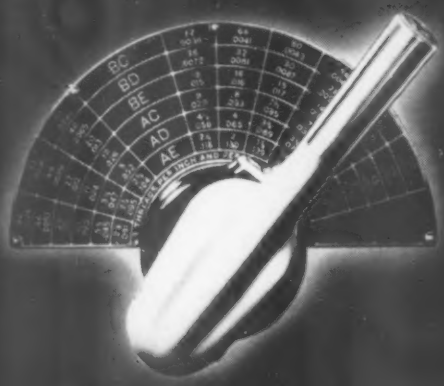
are convenient *and easy to operate*



● In developing the new Sidney Lathe particular attention has been given to the controls both as to convenience of location and as to manipulation.

The new controls are exceptionally easy to shift and the use of the single dial for Sidney's 32 spindle speeds can be quickly pre-selected by the operator. Also the complete range of feeds and leads are readily accessible by means of dial on the front of the gear box.

Apron controls have also been simplified and control for both longitudinal and cross feed is through independent clutch levers which actuate positive serrated jaw plates and is provided with an over-load safety feature.

Thus the new Sidney provides greater ease of operation—saves operator's time—and enables you to get greater production at lower costs.

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THE SIDNEY MACHINE TOOL COMPANY

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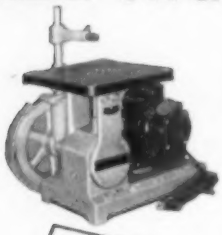
. . . for a Full Range of Tool - Die - and Machine-Shop Work



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—does a precision job of straight-line, sharp-corner filing, sawing and lapping . . . especially in the softer metals prior to hardening. It is widely used in making dies, tools, jigs, fixtures and templates. Sturdily constructed, simple in adjustment and operation. Saw overarm quickly attached.

The Milwaukee PROFILE GRINDER

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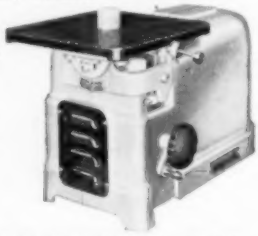

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"The Tool Holder People"

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NEW YORK SAN FRANCISCO

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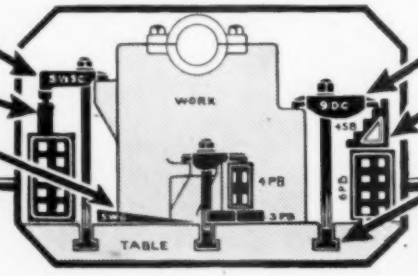

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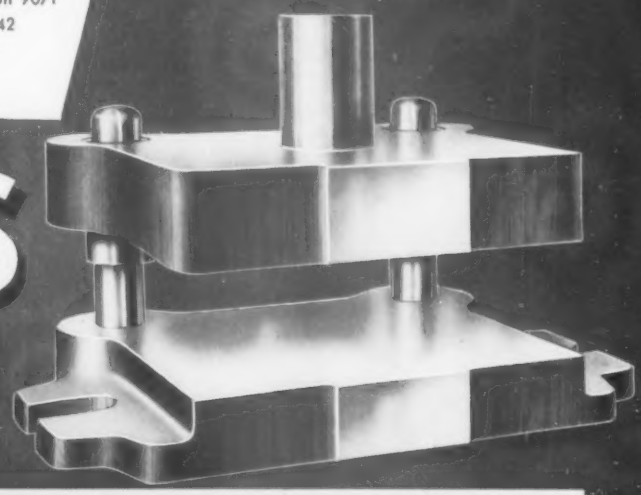

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HOW CAN WE LOWER COSTS?

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HOW CAN WE TAKE KINKS OUT OF PRODUCTION?

HOW CAN WE IMPROVE QUALITY?

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In tapping and reaming, the Ziegler Holder greatly reduces set-up time because it automatically compensates for inaccuracies in spindle alignment up to 1/32" radius or 1/16" diameter.

It also aids materially in reducing spoilage losses, turning out work to the finest of tolerances even when the work is not in perfect alignment with the spindle.

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A Complete THREAD ROLLING SERVICE

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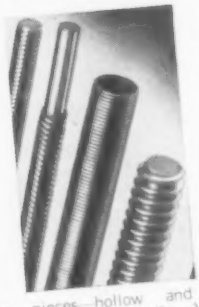

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HEAD CAP SCREWS

They speed assembly because their knurled heads provide a slip- and fumble-proof grip . . . be the fingers and heads ever so oily—therefore, they can be screwed-in faster and farther before it becomes necessary to use a wrench. Their internal wrenching feature facilitates compact designs, so space and weight are saved and cost reduced. Millions upon millions of these time-savers—in sizes from No. 4 to 1½" in diameter and a full range of lengths—are being used throughout industry. Ask for the "Unbrako" Catalog.

Ask us for the name and address of your nearest "Unbrako" and "Hallowell" Industrial Distributor.

You can't tighten or loosen socket screws without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

Kits: pat. pend.

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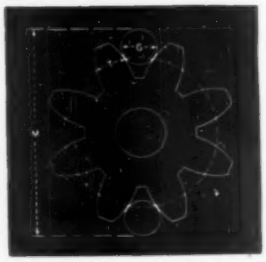

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Midvale Beta Chisel and Midvale Duredge are as durable a pair of tool steels as you'll find in a day's march. Beta Chisel, while not as hard as Duredge, is very tough. It shines in these roles . . . chisels, shear blades, scarfing tools, rivet busters, and many others. Duredge, on the other hand, is a combination of unusual hardness and toughness, and carries a keen cutting edge under the most severe shock conditions. It measures up to all requirements for pneumatic chisels, beading and caulking tools, rivet sets, moil points, punches, etc. Take your choice and you get custom steel quality . . . Midvale quality.

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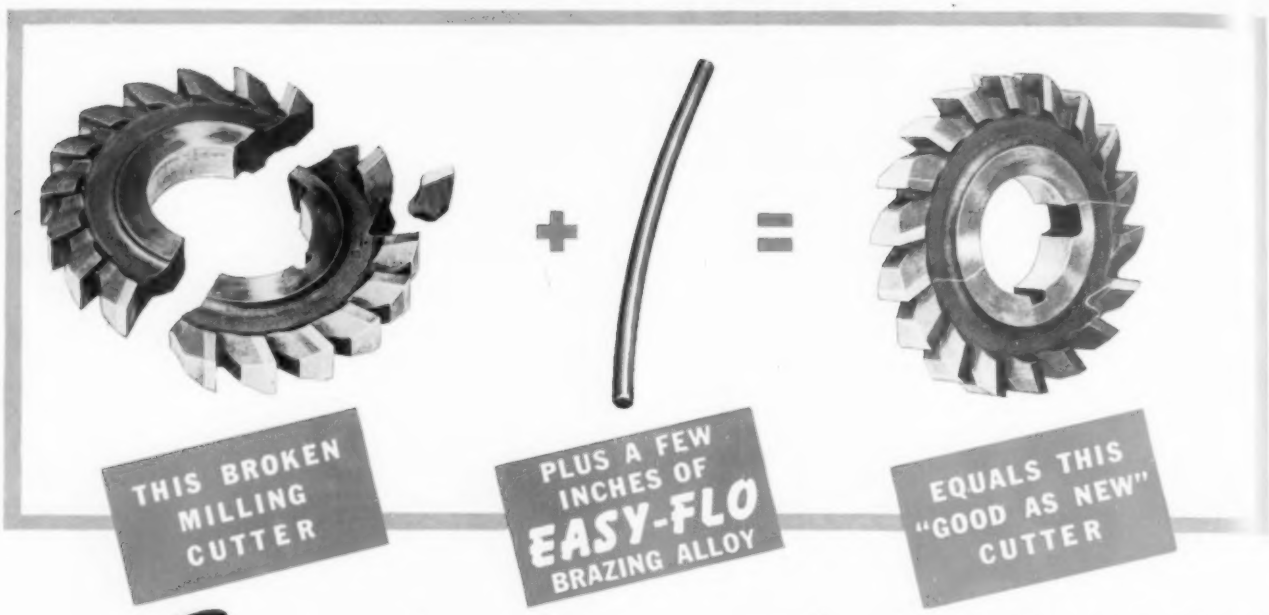
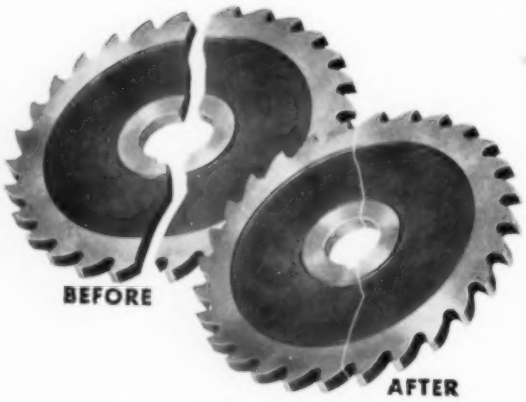
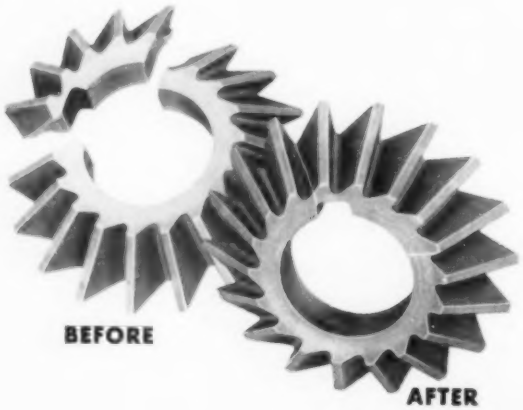


Easy does it-with EASY-FLO





A QUICK LOW-COST WAY TO GET BROKEN TOOLS BACK ON THE JOB

Repair of broken cutting tools by brazing with the low-temperature silver alloy EASY-FLO, has won wide-spread favor in shops throughout the country because it is simple, economical. With a few cents worth of EASY-FLO, a broken milling cutter, like those illustrated, or a broken broach, saw or other production tool, can be restored to service at a small fraction of the cost of a new tool. Any shop man adept in handling a brazing torch can do a good job.

As to the kind of service you can expect from EASY-FLO repaired tools—here's an excerpt from a typical letter:

"We are pleased to advise that the cutter we repaired with EASY-FLO has milled several thousand forgings. Our superintendent advises that this cutter has performed most satisfactorily and in his opinion, is equivalent to a new cutter."

THIS BULLETIN TELLS ALL ABOUT IT

Explains the EASY-FLO features that make the brazing of broken tools so successful and tells you how to apply the method, in a clear step-by-step description. Write today for your copy . . . . . Ask for BULLETIN No. 14.

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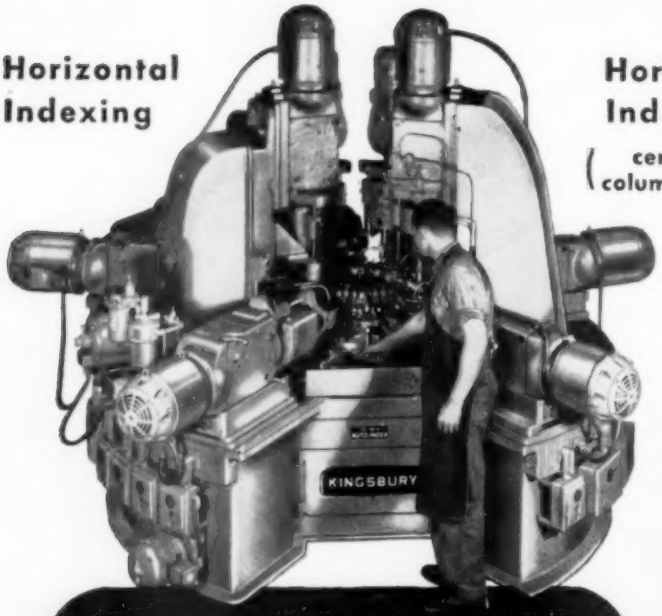
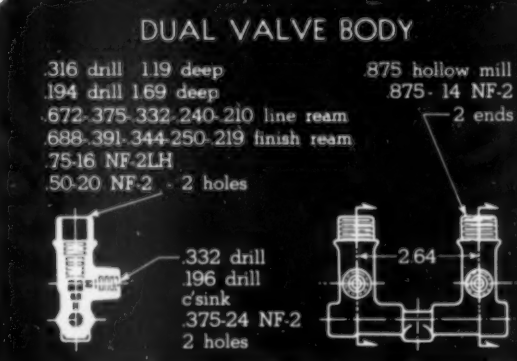
HOW TO SOLVE HIGH PRODUCTION

Horizontal Indexing



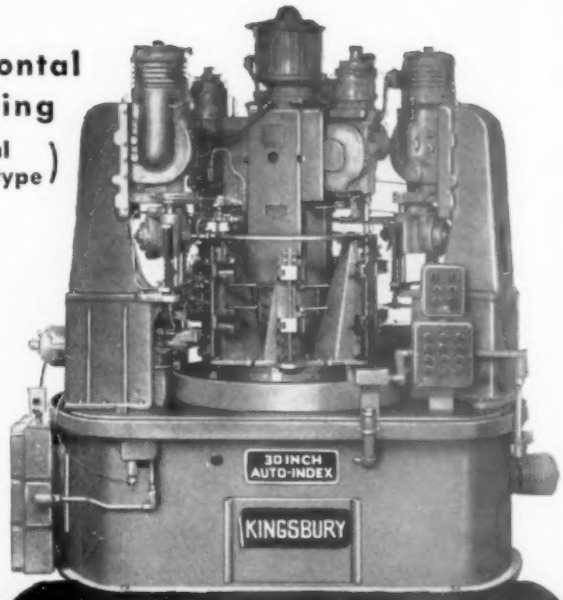
DUAL VALVE BODY



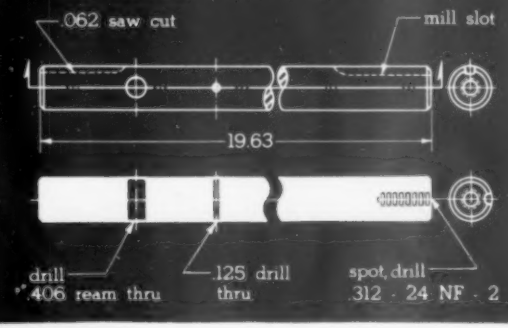
PROBLEM Drill, line and finish ream (with form tools), countersink, tap, hollow mill and thread in one chucking of the part.

METHOD A 24-inch index table supports 10 identical fixtures. It indexes each part in turn to 9 working stations. There are 8 automatic metal-cutting units mounted horizontally on a 100-inch diameter base. Plain or tunnel columns support 4 vertical units. Each unit has a 2-spindle head to work on both branches at once. Bushings guide the drills, line reamers and hollow mills. Production rate: 550 parts an hour.

Horizontal Indexing (central column type)



WASHING MACHINE SHAFT



PROBLEM Mill 3 cuts, spot, drill, ream and tap in one chucking. Operations are at both ends of a shaft over 19 inches long.

METHOD The shaft is vertical so that tools can reach both ends and the fixtures can index. A 7-station indexing machine with a central column supports 9 automatic units. This inside column holds 3 units for the top axial hole. Outside the index table are 3 columns that support vertical milling units for the involute slot and saw cut. Horizontal units drill the cross holes and ream one. Production rate: 190 parts an hour.

Kingsbury machines feature:

7 basic types for efficient application Horizontal indexing. Vertical indexing. Horizontal indexing, central column type. Indexing fixture. Dial Feed. Multi-way non-indexing. Cross drill and countersink. This standard equipment is the basis for solving many types of problems — simple or complex, with few operations or many.

Automatic units Up to 5 hp. Individual speed and cam feed control for efficient operation. Operate at angles. Use multi-spindle auxiliary heads for parallel operations of about equal size and depth.

Accurate location Spindles located to exact indicator readings. Plates for tool guide bushings pilot onto fixtures.

Completely tooled Ready for use.

Electrical installation Complies with the Machine Tool Electrical Standards.

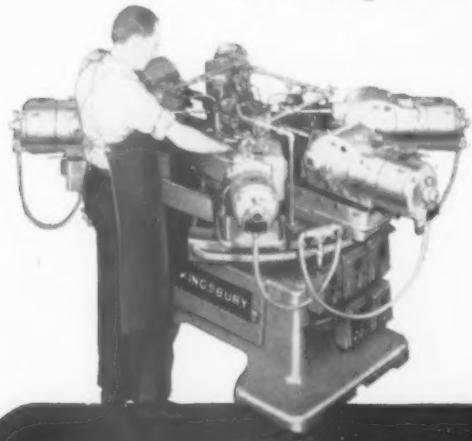
Rugged construction Will do accurate work for years at intense production. Wear parts of heat-treated alloy steel. Preloaded precision spindle bearings. Gears induction-heated and shaved. All castings and weldments normalized before machining.

Experience Over 3400 machines tooled.

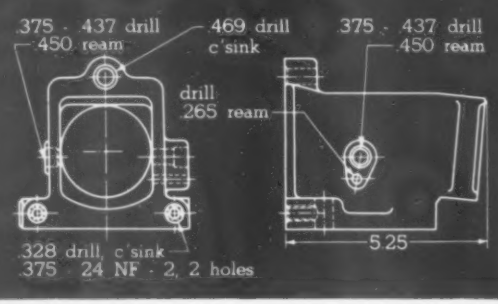
PROBLEMS . . . These 4 automatic drilling and tapping machines combine operations to reduce costs, increase accuracy, save floor space

Vertical Indexing

Indexing Fixture



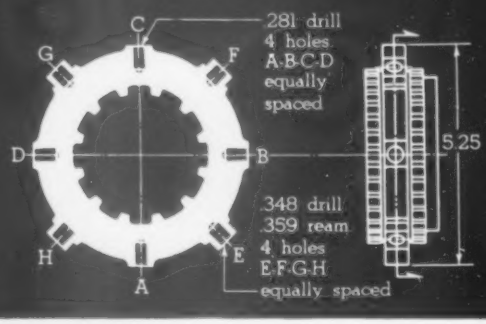
EXHAUST MANIFOLD VALVE BODY



PROBLEM Drill and ream on opposite faces. Drill, countersink and tap on one intermediate face. Complete in one chucking.

METHOD Eight fixtures index in a vertical plane. Opposed horizontal units on the base and deck drill and ream the opposed holes. The feed and speed of each tool is exactly right since each unit is independent. Three radial units (one hidden) with multi-spindle auxiliary heads operate on the .328 and .469 holes. Steel plates carry drill guide bushings and pilot onto the fixtures. Production rate: 286 parts an hour.

SPIDER



PROBLEM Drill and ream equally spaced around the periphery in one chucking. Alternate holes require different operations.

METHOD One fixture holds one part and revolves it on its own axis 90° each index. Two pairs of opposed units 45° apart drill 4 holes (A-C-E-G) after the first index and the other 4 (B-D-F-H) after the second. Two other opposed units ream 2 holes (E-G) after the second index and 2 (F-H) after the third index. Two cams on the fixture operate two valves that trip the units on the proper indexes. Production rate: 88 parts an hour.

When you combine operations, you 1) increase output per man-hour; 2) reduce handling; 3) gain space; 4) finish each part without disturbing it in its fixture to locate operations precisely; 5) use automatic, unvarying work cycles for uniformity.

Can we do this for you? To find out send a print showing operations and required hourly output to Mr. L. A. Carll, Kingsbury Machine Tool Corp., 60 Laurel St., Keene, N. H.

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Bulletin A-14-3 pictures and describes Delta Super-Hi* Drill Presses, for small-hole work from .025" dia. to ¼".

Bulletin A-17 pictures and describes Delta 17-inch Drill Presses.

Bulletin A-20 pictures and describes Delta Cut-Off Machines.

Bulletin A-23 pictures and describes Delta Toolmaker* Surface Grinder, Chip-Breaker Grinder, Tool and Cutter Grinder.

Bulletin A-28 pictures and describes the Delta 14-inch Metal-Cutting Band Saw.

Bulletin A-31 pictures and describes Delta Abrasive Finishing Machines (belt and disk types).

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BY fully utilizing the portability and compactness of versatile Delta Machine Tools, you cut down your capital investment — and reduce your fixed overhead.

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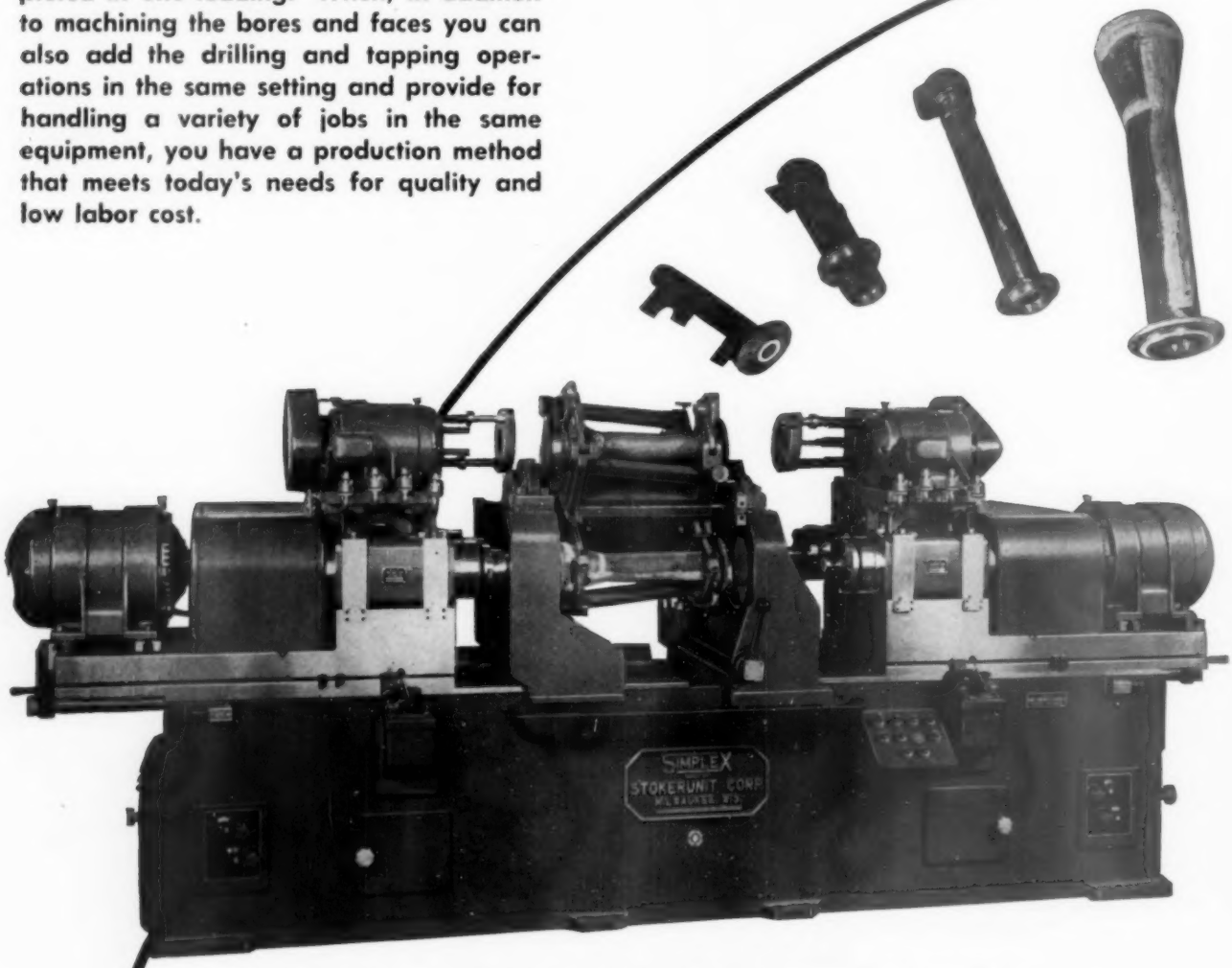
M-29

SIMPLEX

Machining tubular parts where the bores must be concentric, the faces parallel, is a difficult job unless the work can be completed in one loading. When, in addition to machining the bores and faces you can also add the drilling and tapping operations in the same setting and provide for handling a variety of jobs in the same equipment, you have a production method that meets today's needs for quality and low labor cost.



The machine pictured is a SIMPLEX 4U 2-way Precision Boring Machine with four #4 spindles mounting combination boring and facing heads and also carrying unit type drilling heads with bushing plates for the drilling operation. By changing the fixtures, drills and boring tools, the various pieces illustrated can be handled with the same machine, thus this machine becomes in effect a production department in itself.

Precision Boring Machines

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SIMPLEX Machine Tools Division

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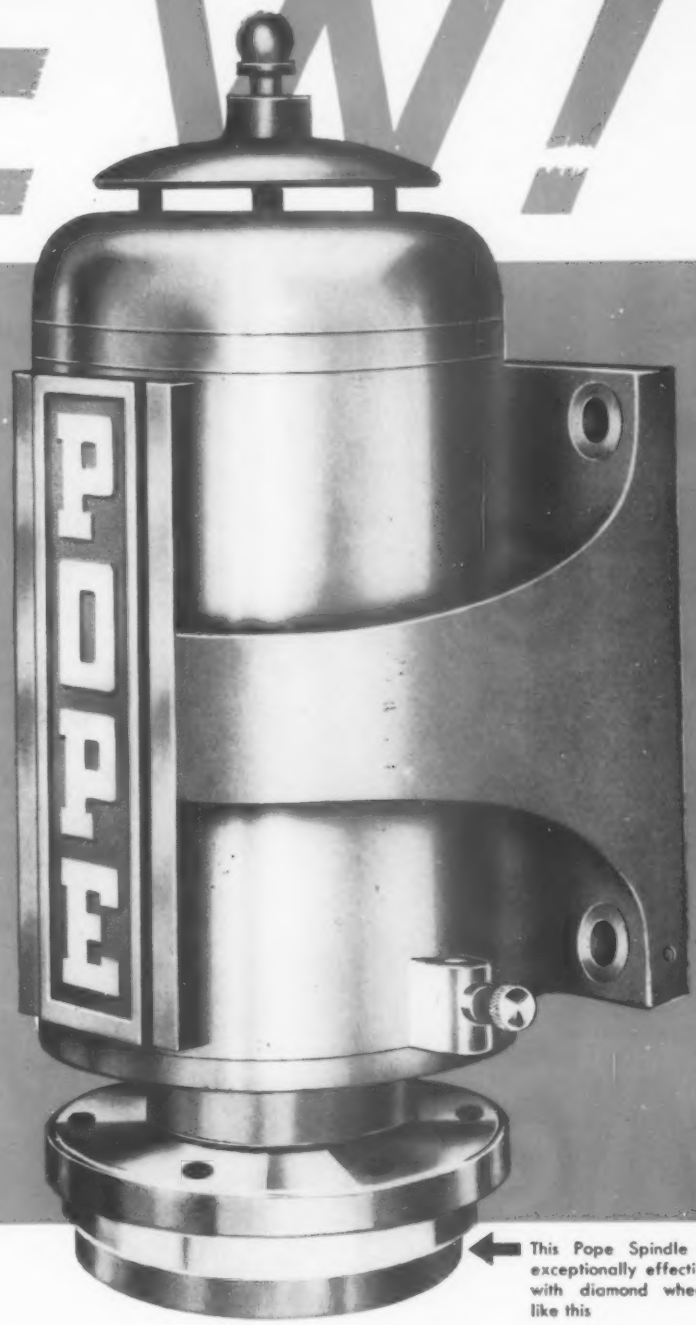

This Pope Spindle is exceptionally effective with diamond wheels like this

This POPE Spindle is equipped *with sealed-in lubrication, totally enclosed fan cooled motor, super-precision bearings* and with the power, the bearing capacity and the rigidity to remove metal fast and produce a fine finish.

It is available with flange or tapered nose for quick mounting of various types of grinding wheels.

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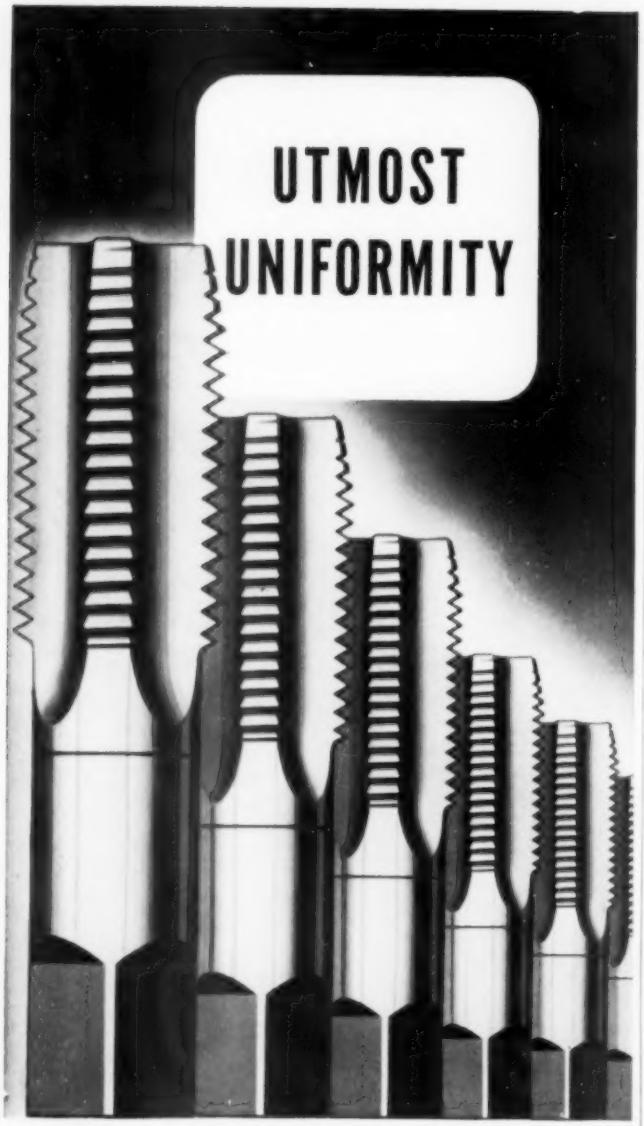

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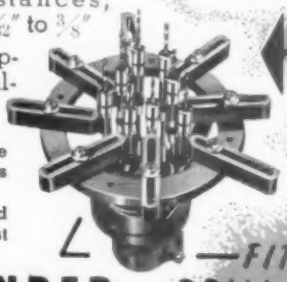

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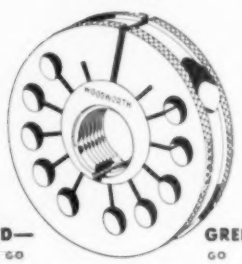

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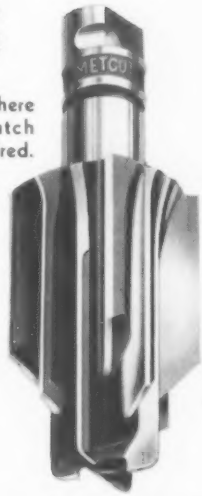

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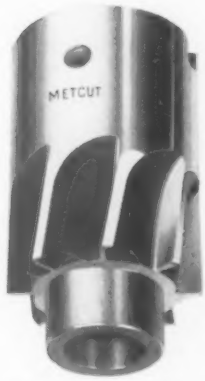

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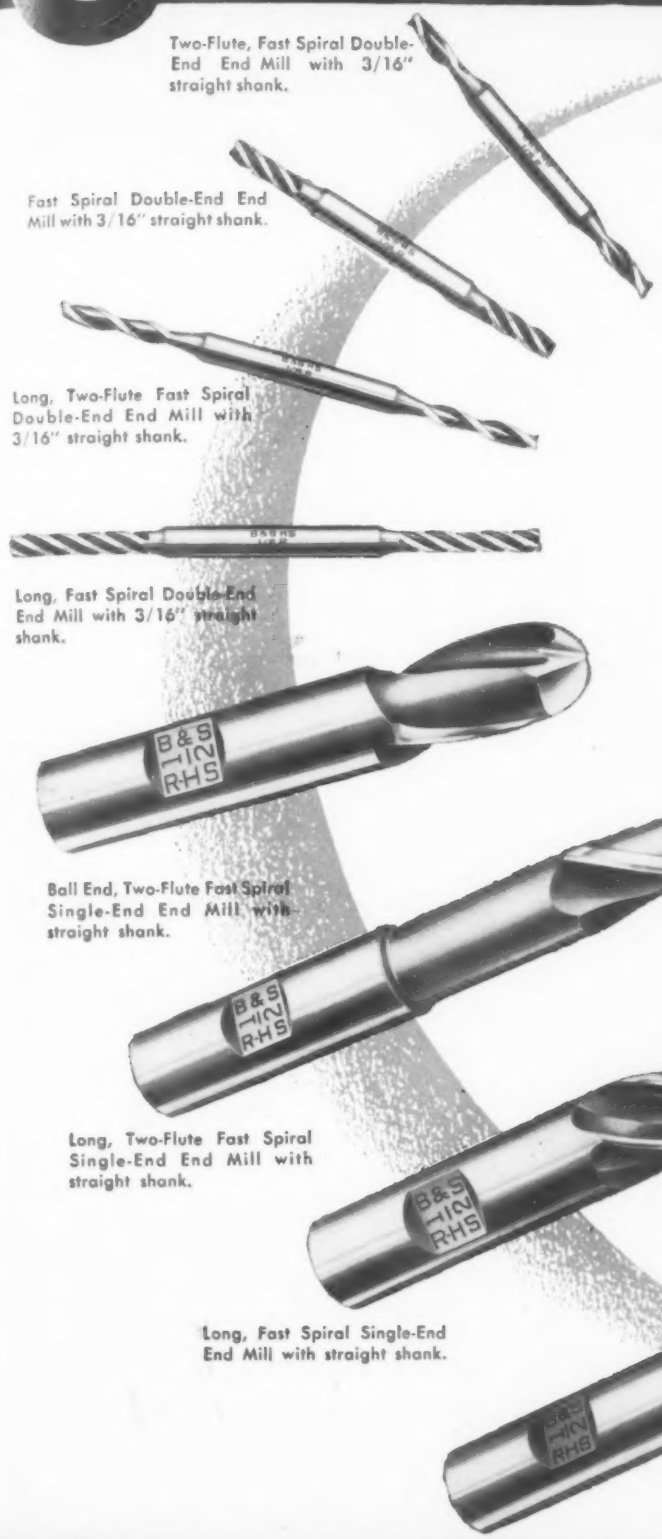

Two-Flute, Fast Spiral Double-End End Mill with 3/16" straight shank.

Fast Spiral Double-End End Mill with 3/16" straight shank.

Long, Two-Flute Fast Spiral Double-End End Mill with 3/16" straight shank.

Long, Fast Spiral Double-End End Mill with 3/16" straight shank.

Ball End, Two-Flute Fast Spiral Single-End End Mill with straight shank.

Long, Two-Flute Fast Spiral Single-End End Mill with straight shank.

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Extra-Long, Fast Spiral Single-End End Mill with straight shank.

● These 8 types of end mills, now added to the Brown & Sharpe line, are made in a complete range of sizes to meet practically all work requirements. Together with many new sizes in other designs previously offered, their addition provides an even broader, better selection of Brown & Sharpe quality end mills.

All end mills in this new group have the same design and construction features that distinguish Brown & Sharpe end mills for their fast, clean-cutting characteristics. They will help you improve the efficiency of end mill operations . . . producing more work at lower cost. Get complete information on these new additions and the new breadth of the Brown & Sharpe line of end mills. Write for new End Mill Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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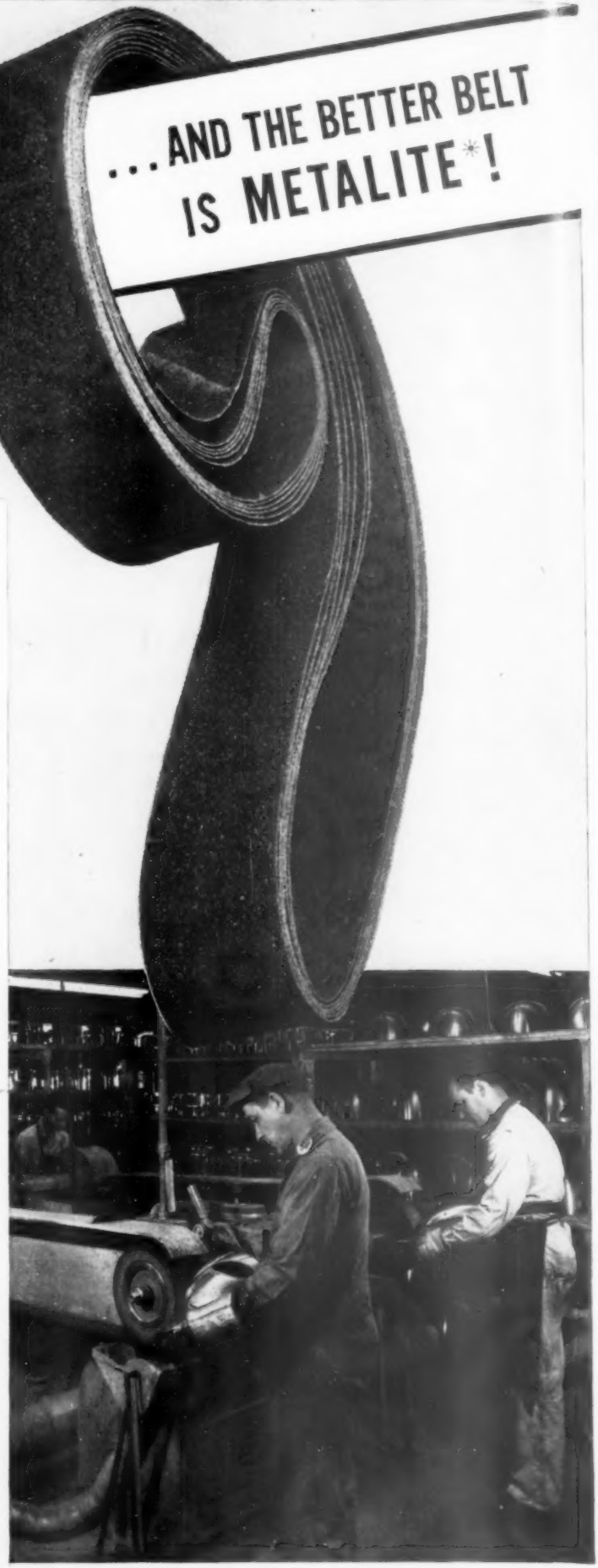

Back of the brilliant success story of the backstand-belt method, lies the equally brilliant production record of Behr-Manning Metalite* Cloth Backstand Belts for grinding, polishing and finishing. For the metal finishing industry has had to be shown the advantages of the belt method by competitive tests — tests which so consistently showed production increases of 2 to 4 times the old set-up wheel method.

Metalite Cloth Belts have sold the belt method because, as their name implies, they're right for metal. Their fast-cutting abrasive is genuine Norton Alundum grinding wheel grit, and each sharp, tough crystal is twice anchored with Behr-Manning's own Durabonded* adhesive that grips and holds under heat or pressure. The cloth backing is rugged and pre-finished for maximum adhesion and resistance to stretching. The Uniflow joint runs bump-free and true. That's why Metalite is right for metal. Write or wire or phone us for your own free demonstration of the belt method with better Metalite Cloth Belts.

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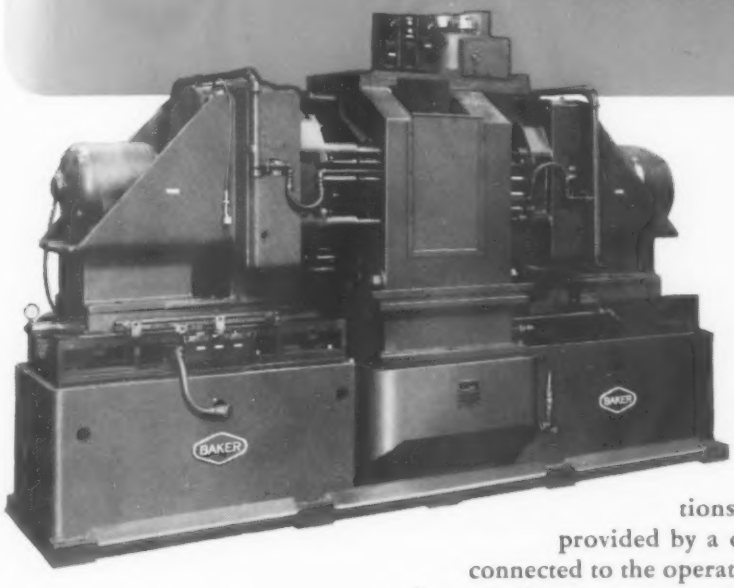
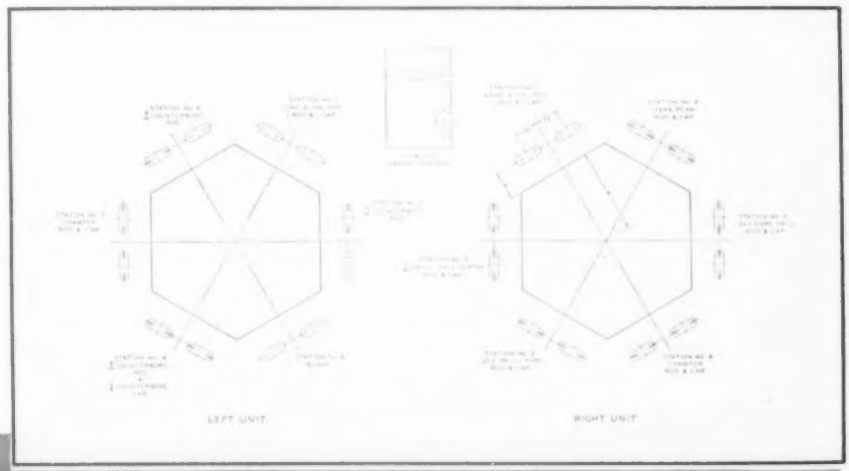


TWO-WAY HIGH PRODUCTION MACHINE

High production machining of automobile connecting rods and caps is done faster on the illustrated new Baker two-way horizontal special floor-type machine. The right and left drilling units are standard model 15 x 16 hydraulic feed units that may be mounted in horizontal, vertical or angular planes with adaptability to single or multiple spindle operations. Hydraulic power for the 15 x 16 units is provided by a completely separate mobile pump sump unit connected to the operating cylinder of the machine by only two self-sealing couplings. Power unit is mounted on casters for easy exchange. For engineering data covering the 15 x 16 unit write for circular No. 69955.

Baker special high production machine with 15 x 16 units. Right unit drives a 20 spindle fixed center multiple head assembled with a self contained lubricant pump. Left unit drives a 12 spindle head. Machine is equipped with a six station automatic index trunnion arranged to clamp one automotive connecting rod and cap at each station. See illustration and diagram at right.



BAKER BROTHERS INC., TOLEDO, OHIO

DRILLING . . . TAPPING . . . KEYSEATING . . . CONTOUR GRINDING MACHINES

WINTER BROTHERS TAPS ARE DEPENDABLE

RAW MATERIAL SPECIFICATION

Winter Pulley Taps are used for tapping inaccessible parts which cannot be reached by standard Hand Taps. They are part of Winter's complete line of High Speed and Carbon Steel Taps and Dies.

The tap you buy is no better than the material from which it is made. In the Winter laboratories, these materials are rigorously tested—tested for hardness, for cutting qualities, and for ability to stand up under hard and steady use. Careful raw material control is an important reason why you can depend on Winter Taps.

Always at Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter Taps on his shelves—as close to your tapping problems as the telephone on your desk.

Winter Brothers COMPANY

ROCHESTER, MICHIGAN, U. S. A. • Distributors in Principal Cities • A Division of the National Twist Drill and Tool Company • Branch Stores: Detroit, Chicago, San Francisco

WINTER

PERFORMANCE IS BUILT INTO NATIONAL METAL CUTTING TOOLS

MANUFACTURING METHODS

The Double-End End Mill shown is representative of a complete line of End Mills made by National. Other products are Twist Drills, Reamers, Milling Cutters, Hobs, and Special Tools.

Good materials and modern methods are both needed to make good metal cutting tools. At the new National plant, skilled engineers carefully supervise each step in the production process, from blueprint to finished product. This is an important factor in building performance into National Metal Cutting Tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

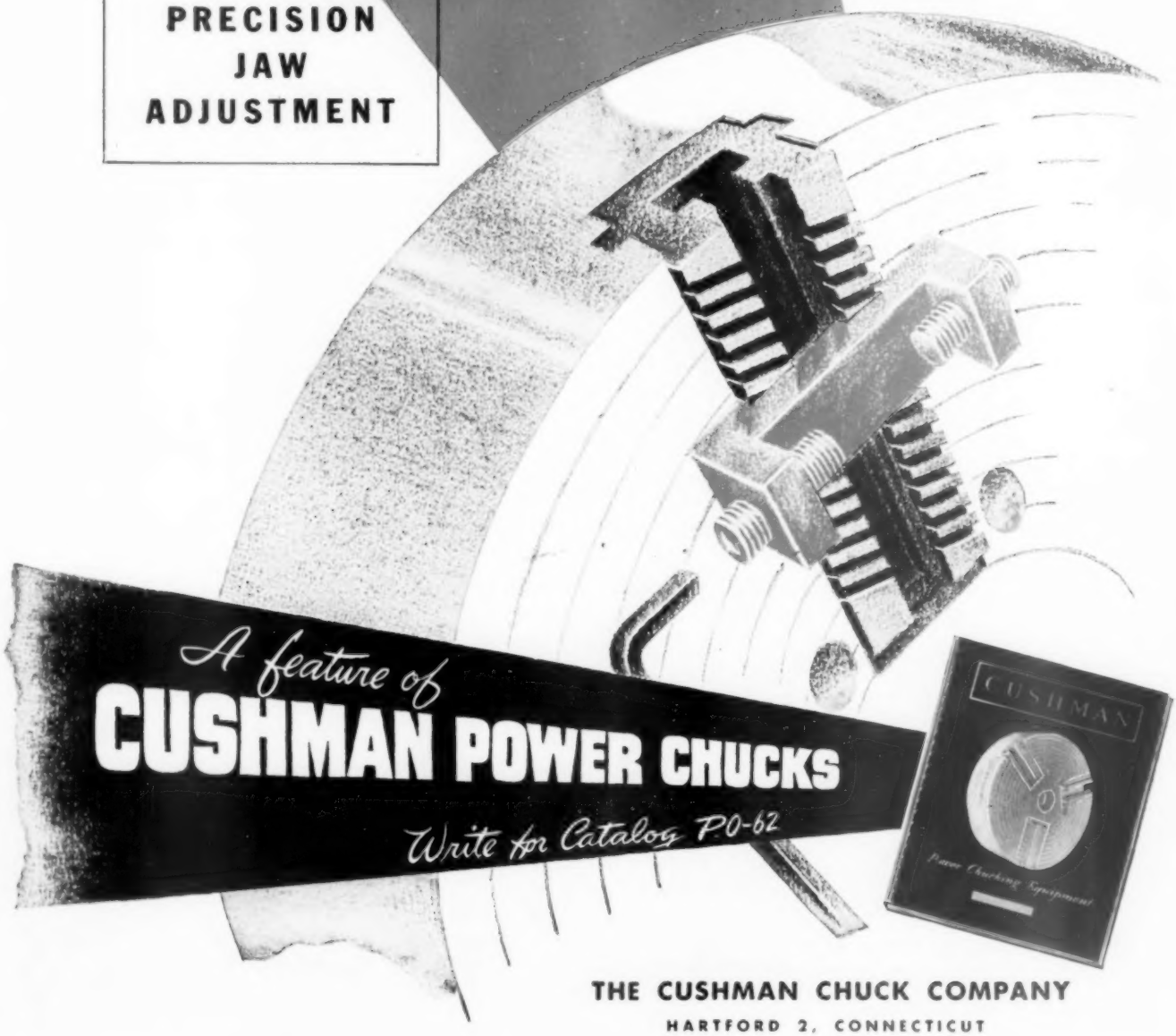
ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division—Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

NOT ONLY A BETTER CHUCK
BUT ALSO A BETTER
WORK-HOLDING METHOD

"ACCRALOCK"

PRECISION
JAW
ADJUSTMENT



A feature of
CUSHMAN POWER CHUCKS
Write for Catalog PO-62

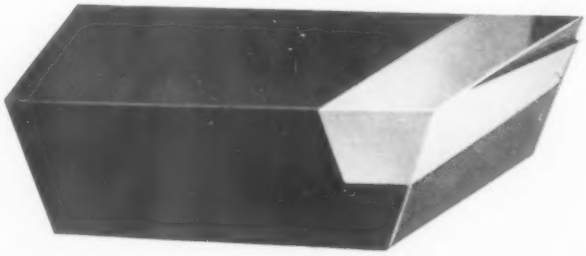
THE CUSHMAN CHUCK COMPANY
HARTFORD 2, CONNECTICUT

7C548

Machining Monel?

This HAYNES STELLITE Tool has done a Job on Monel Valve Stems

Monel valve stems of various lengths and diameters are turned out faster with HAYNES STELLITE Tools.



A 1-in. square box tool, fabricated in the user's shop by brazing a HAYNES STELLITE 98M2 tip to a steel shank, does the combined rough- and finish-turning of valve stems made of cold-rolled Monel . . . at a speed of 557 r.p.m. . . . 240 surface ft. per min. . . . with a feed of 0.021 in. and a 3/8-in. depth of cut.

After 30 hours of use, the tool shows no sign of wear. The tool is ground to provide a 15-deg. side rake angle and a 15-deg. back rake angle; end and side relief angles of 6-deg.; a radius of 1/32 in. . . . and no lead angle.

Another HAYNES STELLITE tool subsequently cuts the acme thread at 297 r.p.m. . . . 72 surface ft. per min., with a cut of 0.020 in. per pass.

If you have a machining problem, a letter or phone call to our nearest office will bring a representative to tell you more about the effective use of HAYNES STELLITE cobalt-base alloy tools . . . on Monel, steel, cast iron, bronze, and other materials.

You can obtain more information about HAYNES STELLITE 98M2 tools by writing for the booklet, "HAYNES STELLITE Metal-Cutting Tools," Form 5401.

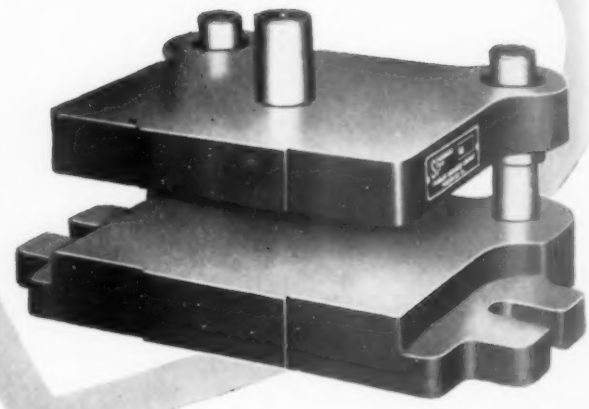
Haynes Stellite Company
Unit of Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston
Los Angeles—New York—San Francisco—Tulsa

The registered trade-marks "Haynes" and "Haynes Stellite" distinguish products of Haynes Stellite Company.

HAYNES
TRADE-MARK
alloys

THE HEART OF THE PRESS

"Standard"
DIE SETS



- Lengthen tool life.
- Decrease set-up time.
- Used with any make of press.
- All parts strictly interchangeable.
- Prompt shipment on all catalog sizes.

Ask for catalog

STANDARD MACHINERY COMPANY

1585 ELMWOOD AVE., PROVIDENCE 7, RHODE ISLAND

Branch Warehouses:

CLEVELAND	DETROIT	INDIANAPOLIS	NEW YORK	PHILADELPHIA	WORCESTER
The Die Supply Co. 5349 St. Clair Ave. Utah 1-0550	Diemaker Supplies Co. 2679 E. Grand Blvd. TRinity 1-2865	Standard Die Supply, Inc. 26 E. McCarty St. Riley 5824	Acme-Danneman 203 Lafayette St. CAnal 6-1760	Fidelity Tool Supply 309 Vine St. CAmden 4-7765	Lindco, Incorporated 1023 Southbridge St. WOrcester 6-4637

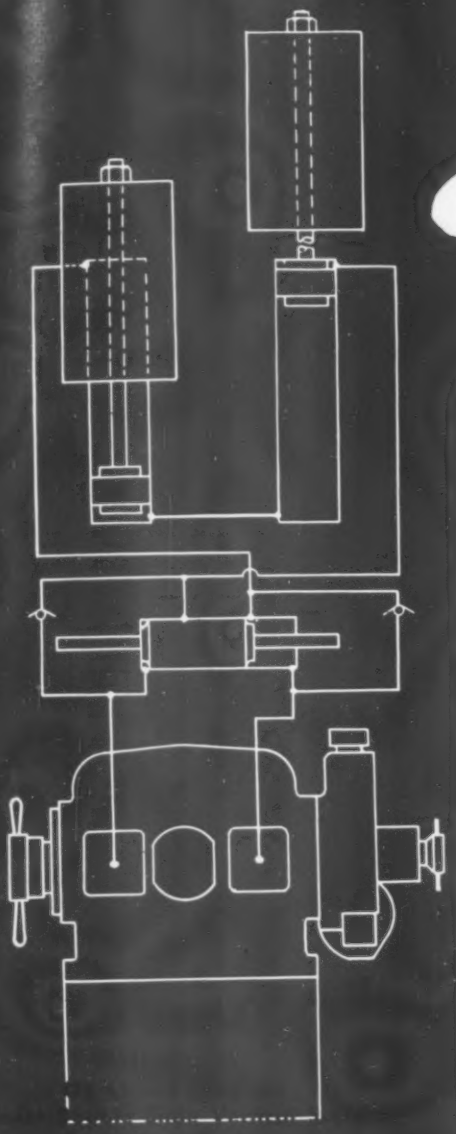
Mac-it ALLOY STEEL SCREWS

Insure smoother operation at POSITIVE levels with STRIPPER BOLTS!

Mac-it Stripper Bolts or Shoulder Screws have greater holding power where you want it in die-assemblies. They are also used as stud bolts and in various machine assemblies. Easily tightened with Mac-it Key. Will not work loose. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY
STRONG, CARLISLE & HAMMOND COMPANY
CLEVELAND 13, OHIO
MANUFACTURED BY
MAC-IT PARTS COMPANY LANCASTER, PA.

SPECIAL features are *Standard*



A. Oilgear Two-Way Electro-Hydraulic Controlled Variable Delivery Pump.
B. Interlock Cylinder for Operating Shuttle Tables.
C. Left Hand Tool Slide Cylinder.
D. Right Hand Tool Slide Cylinder.

Oilgear Broaching Machines employ Oilgear Fluid Power Systems. These Systems provide as *standard* equipment: (1) important, exclusive, patented features that other systems do not offer; and (2) additional features available only at extra cost in other machines.

Important Features of Oilgear Broaching Machine Fluid Power Systems are:

1. Oilgear two-way reverse flow variable delivery pumps which provide higher cutting speeds as *STANDARD*.

2. Two-way reverse flow variable delivery pumps which enable you to independently adjust cutting and return speeds to the maximum permissible requirements of the job . . . and to the ability of the operator to serve the machine.

3. Exclusive patented electro-hydraulic two-way directional pump control which eliminates the usual conglomeration of separate valves and piping . . . and condenses all controls into a simple unit integral with the pump.

4. Positive broaching speed under load up to 150% overload.

5. *Savings* in power because Oilgear *uses* power only in proportion to the speed and force required . . . because its regenerative circuits reclaim power on every return stroke . . . and because it employs *NO* speed, directional or other valves t waste power.

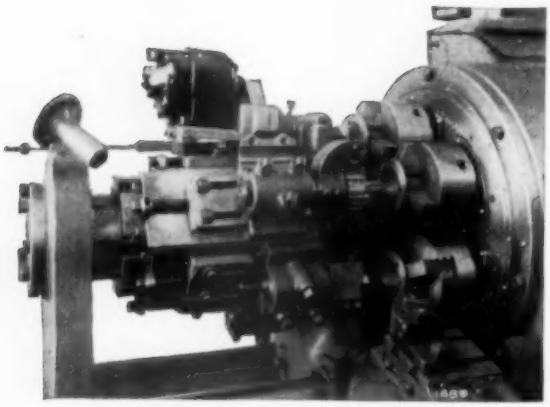
6. Simple systems which use less piping require less space, employ smaller motors operate efficiently with smaller fluid reser voirs, require less oil, promote goo housekeeping.

7. Compact machine construction with al parts easily accessible for adjustmen and servicing.

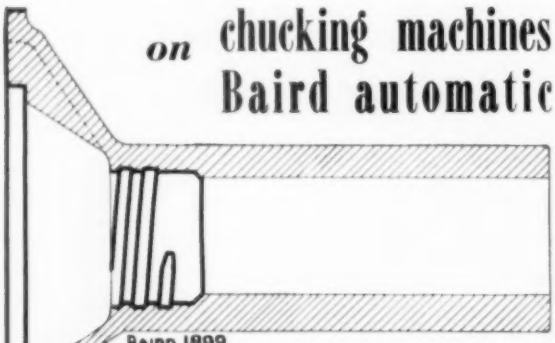
Oilgear Broaching Machines always hav been and are today the most highly produc tive line of broaching machines. There i an Oilgear Machine for every broachin need and if you are not familiar with th entire line you are invited to send fo bulletins. THE OILGEAR COMPANY
1308 W. Bruce St., Milwaukee 4, Wisconsin

Oilgear
Fluid Power

versatility



COMPLETE TURNING
plus
MILLING OPERATIONS
are really accomplished
on chucking machines Baird automatic



BAIRD 1899

This part is a malleable casting, having a 4½" dia. flange. The flange end is completely turned, and the spiral groove in the hole is milled in one operation, as shown. Production is 132 pieces per hour.

In conjunction with the turning operations, "Baird" chucking machines can be readily equipped for a large range of varied and special machining operations: including Milling, Multiple Hole Drilling, Tapping, Cross Drilling, etc.

To perform your multiple machining operations profitably "ASK BAIRD ABOUT IT"

THE Baird
MACHINE COMPANY

STRATFORD 9, CONNECTICUT

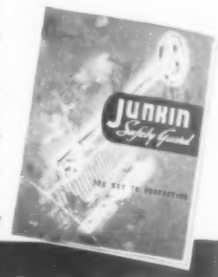
A TRAGIC PENALTY FOR *ONE* MISTAKE

Operating an unguarded press is an invitation to tragedy, suffering and expense.

JUNKIN automatic safety guards for presses are helping thousands of enthusiastic users set new safety records . . . higher production schedules.

JUNKIN guards operate automatically from foot pedal, fall by gravity to bolster plate. Press can't operate until guard is in position.

Write for this New Bulletin

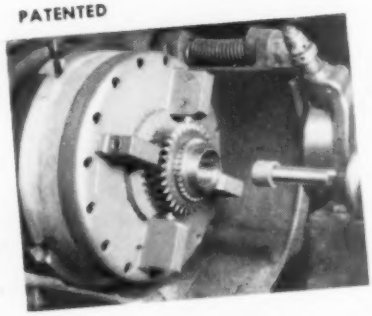


JUNKIN SAFETY APPLIANCE CO., Inc.
830 W. HILL STREET LOUISVILLE, KENTUCKY

JUNKIN SAFETY GUARD

DIAPHRAGM CHUCKS

PATENTED



Look, a high speed, precision chuck with no parts to wear out! *Result:* Maximum accuracy, minimum maintenance! *Because* the Woodworth design assures the ultimate in concentric chucking. *Obviously*, it will solve your precision chucking problems, as it has already for large manufacturers of gears and other production parts. Send your precision chucking problems to us—at no obligation.

MECHANICALLY OR AIR OPERATED

ACCURACY YOU CAN TRUST

WOODWORTH
N. A. WOODWORTH COMPANY
1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

this "HELPING HAND"

has 5 strong fingers

BESLY TAPS

A Complete Line

Top Quality Taps

Faster Delivery

Expert Engineering Counsel

Specialized Distributor Service

It Can Help You to PULL Tapping Efficiency UP... PUSH Tapping Costs DOWN!

HELPFUL FACTS FOR TAP USERS

This valuable booklet contains vital information on taps and tapping procedures. Tap drill sizes, and tapped hole sizes are shown in detail. Write on your letterhead for your copy—FREE.

It takes more than taps alone to get accurate threading at the lowest possible cost. When you call on Besly, you *get* more!

True, Besly gives you top quality in a complete line of taps for every threading job. But, in addition—because of Besly's location in the center of most major metal-working markets—you get *Fast Deliveries* to help start your rush jobs sooner:

- OVERNIGHT *Shipment* on stock taps;
- 24-HOUR *Shipment* (after receipt of order) on "Specials" that can be made from standard hardened blanks;
- *Within 3 weeks* on "Specials" made from bar stock.

Carefully selected distributors are backed by the *expert* counsel of Besly Field Engineers. Besly's *"Helping Hand"* has helped many to *pull up* tapping efficiency; *push down* tapping costs. It can put these things in your grasp, too. Ask Besly to show you how.

You'll Do BETTER with **BESLY**

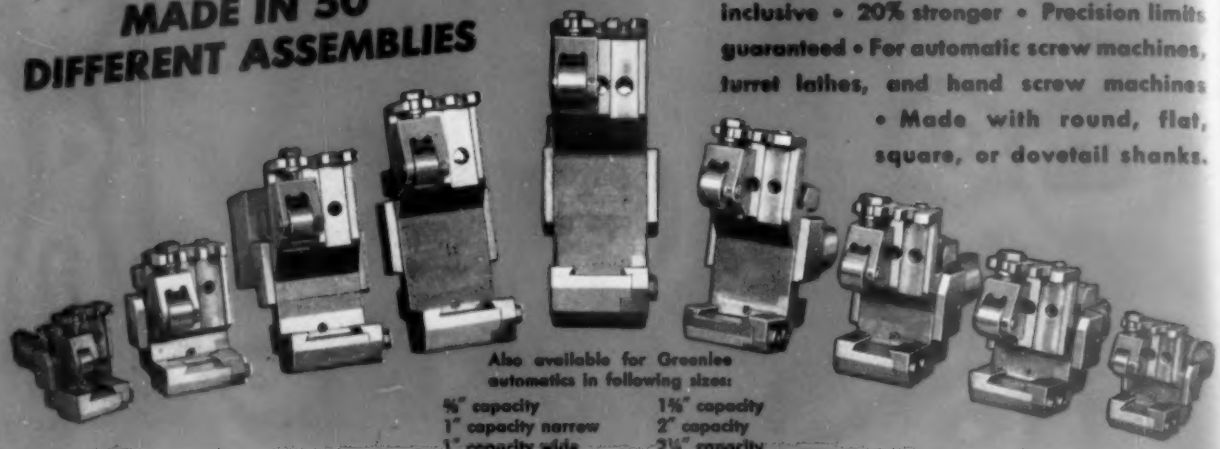
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

CHARLES H. BESLY & COMPANY • 118-124 North Clinton Street, Chicago 6, Illinois
Factory: Beloit, Wisconsin

Slitters SHAVING TOOL HOLDERS

MADE IN 50 DIFFERENT ASSEMBLIES

Loose jaw for easy tool removal and to take up variance in sizes • 13 sizes 7/16" to 5" inclusive • 20% stronger • Precision limits guaranteed • For automatic screw machines, turret lathes, and hand screw machines • Made with round, flat, square, or dovetail shanks.



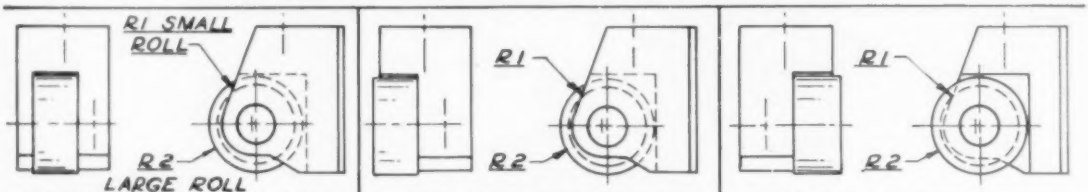
Also available for Greenlee automatics in following sizes:

5/8" capacity	1 5/8" capacity
1" capacity narrow	2" capacity
1" capacity wide	2 1/4" capacity

Now Available in Three Types

Adding New Roller Positions to the Shave Tool Holder

STANDARD ROLLER BACK RESTS



STRADDLE TYPE: MADE FOR ALL SHAVE TOOL HOLDERS - SIZES 7/16" TO 5" INC.

LEFT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS FROM SIZE 7/16" TO 2 1/4" INC.

RIGHT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS IN 3 SIZES ONLY - 7/16"; 5/8"; & 1".

FOR RESTRICTED CENTER DISTANCES

R4 RA4 7/8" and 1"—2nd Pos.

R4 RA4 7/8" and 1"—3rd Pos.

R6—9/16" RA6—9/16" and 1" 3rd Pos.

R6—9/16" RA6—9/16" and 1" 4th Pos.

ACME-GRIDLEY MULTIPLE SPINDLE BAR MACHINES

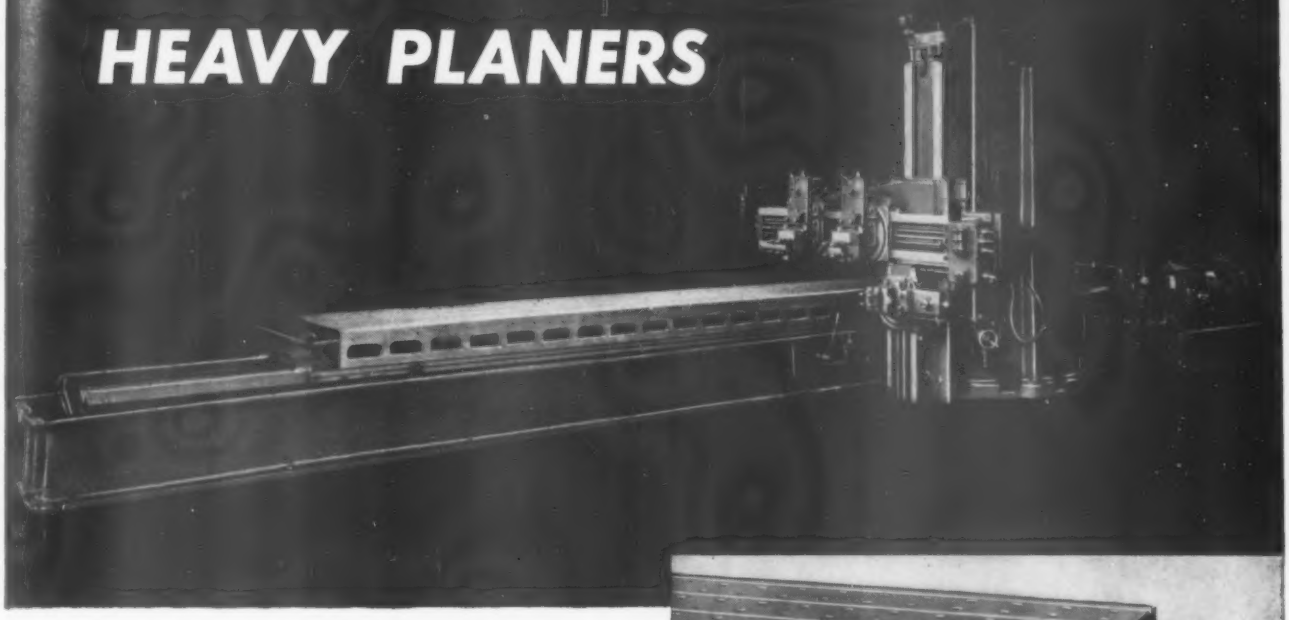
SCREW MACHINE TOOL COMPANY

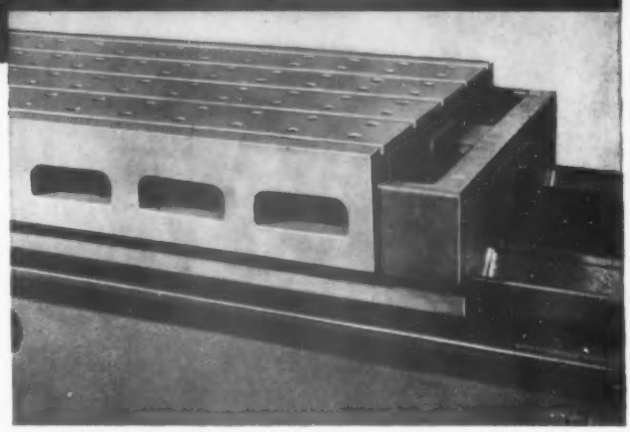
17565 SWIFT AVENUE • DETROIT 3, MICHIGAN

MANUFACTURERS OF ACCESSORY TOOLS FOR ALL TYPES OF AUTOMATIC SCREW MACHINES

NICKEL CAST IRON...

...for IMPROVED HEAVY PLANERS





IN PARTS LIKE THESE . . . *Rockford minimizes scoring of surfaces, by use of Nickel alloyed iron that provides strong, dense grained castings.*

This Rockford planer incorporates a basic improvement: *the application of hydraulic pressure to a straight line table drive.*

Developed by the Rockford Machine Tool Company, this advanced design not only reduces the number of moving parts, but completely eliminates rack and gearing, with their high inertia forces . . . thus making possible greater convenience and speed of operation with high accuracy.

Heavy feeds and speeds of the planer, naturally, call for good wear-resistance on working surfaces. Moreover, the hydraulic controls require sound, pressure-tight, readily machinable castings. Accordingly, Rockford engineers specify a Nickel-chromium iron for tables, feed cylinders, saddles, tool slides, valve bodies and other parts of the hydraulic system.

"This Nickel alloy iron," states Rockford, "has proved its value in the production of long-lasting cast parts, free from scoring on the ways of sliding members, and from leaks or pressure losses where hydraulic stresses are high."

When you need parts for tough jobs . . . think of Nickel alloys.

EMBLEM OF INCO SERVICE

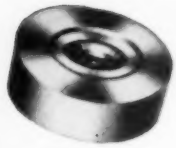
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes and other alloys containing Nickel. This information and data are yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

Talide (TUNGSTEN CARBIDE) Drawing Dies

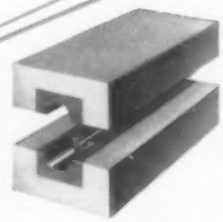
20 to 100 Times the Life of Steel Dies



DRAWING DIES
(For Wire, Tubing and Bar Stock)

SPINNING AND CURLING ROLLERS

PIERCING AND LAMINATION DIES



SWAGING DIES
(For Forming Solid and Tubular Shapes)

BLANKING AND FORMING DIES
(For Stamping Lamination Discs, Metals, Plastics, Paper)

POWDER METALLURGY DIES *(For Compacting Powdered Metals and Materials)*

Isn't low unit cost your ultimate objective? You get more speed and output on long production runs and at lower maintenance cost with the superior quality of Talide Dies. Talide Dies out-perform and out-wear steel dies 20 to 100 times. Talide (the hardest metal made) saves up to 50 hours polishing and redressing time on a single die. And, since Talide Metal takes and imparts the smoothest finish possible, surface defects are practically eliminated. Purchase Talide (tungsten carbide) Dies in any practical shape and of inside diameter up to 24".

Write for Die and Wear Part Catalog 46-WP.

Talide (TUNGSTEN CARBIDE) Performance!

TUBE MANDRELS

HEADING AND EXTRUSION DIES
(For Shaping and Sizing Bolts, Nuts, Screws, and Collapsible Tubes)

TALIDE METAL MEETS EVERY REQUIREMENT

SINTERED CARBIDES — MC — TALIDE — METAL CARBIDES CORPORATION, YOUNGSTOWN, OHIO — HOT PRESSED CARBIDES

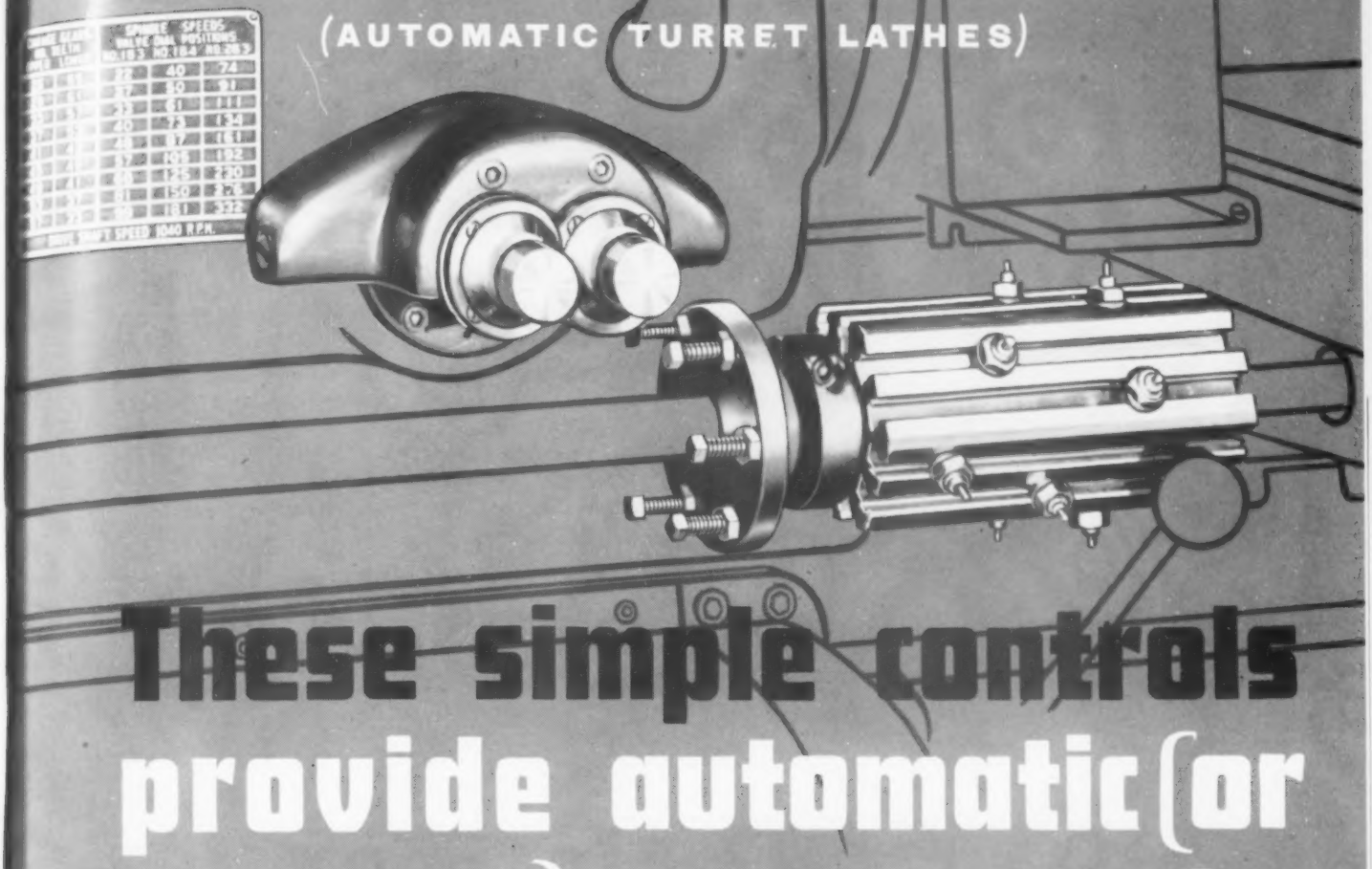
METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

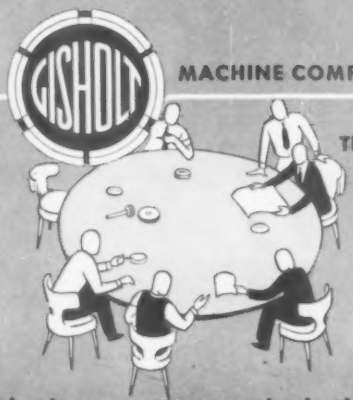
GISHOLT FASTERMATICS

(AUTOMATIC TURRET LATHES)



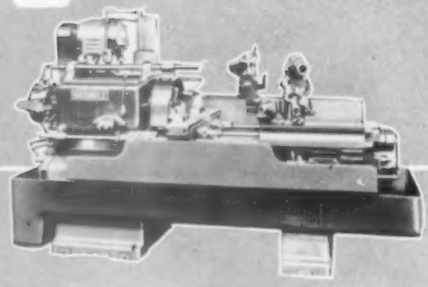
These simple controls provide automatic (or manual) selection of speeds--to save time --cut machining costs

GISHOLT MACHINE COMPANY, *Madison 3, Wisconsin*



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.



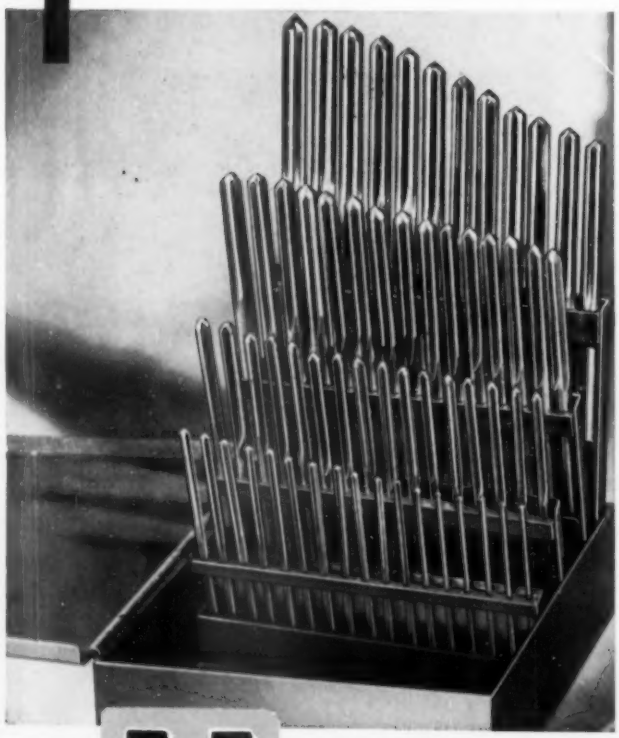
THE FASTERMATICS—Speed changes are effected as buttons in spool contact hydraulic control knobs. Changes may be made automatically at any point during hexagon turret's travel, or manually for convenience of set-up. Various ranges of spindle speeds are available.

turret lathes · automatic lathes · superfinishers · balancers · special machines

Specialists

It takes many people and many things to keep an unvarying accent on the accurate dimension control, fine finish and super-hardness inherent in L & I Ground Flute Reamers. Strict adherence to a singularly high purpose such as this places these Wire Gage Sizes in a class apart. Available in complete sets or individual sizes. Your advantage . . . eliminating the delay and added cost of ordering specials.

• There are sixty-nine in-between-sizes of L & I Wire Gage Reamers — from 5/16 down to .040.



L&I *Reamers* GROUND FROM THE SOLID

LAVALLEE and IDE, Inc.
CHICOPEE • MASSACHUSETTS

WITH A "ROCKWELL" HARDNESS TESTER *Made Only by Wilson*

Every Test is Accurate

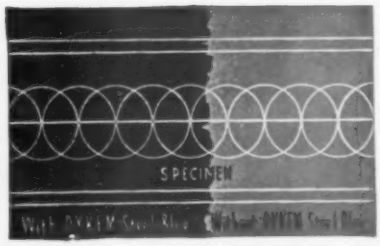
This girl tests thousands of parts every day. Yet every test is as accurate as though made in a laboratory. In many factories today, production line hardness testing is protecting the quality of products and the reputation of manufacturers. Only the dependable accuracy of "ROCKWELL" Hardness Testers makes this possible. WILSON also makes the TUKON Microhardness Tester.

WILSON ACCO
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-H PARK AVENUE, NEW YORK 17, N. Y.

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2303D North 11th St., St. Louis 6, Mo.
In Canada: 2466 Dundas St. West, Toronto, Ont.

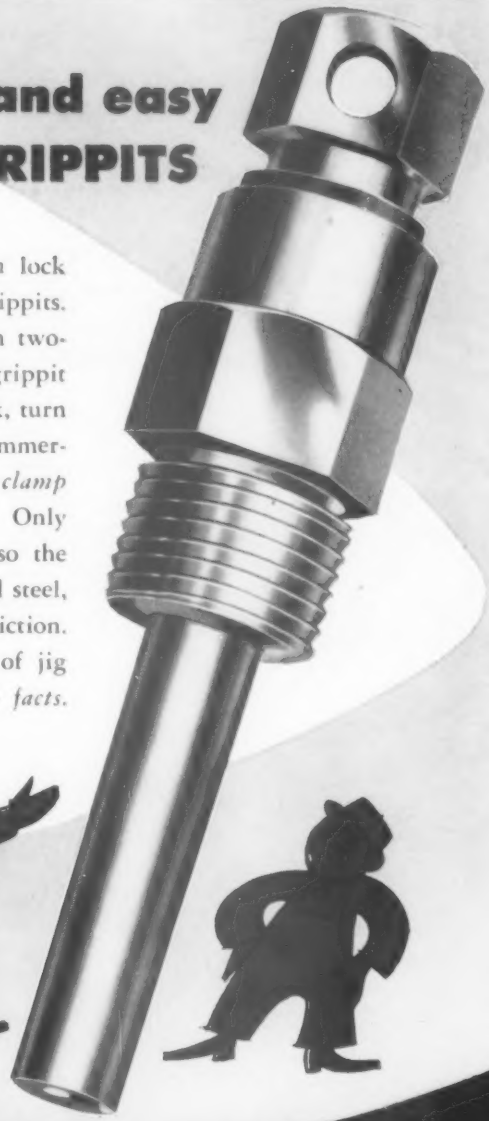
DIAMONDS FOR WHEEL DRESSING TOOLS
DIAMONDS FOR THREAD GRINDING TOOLS
DIAMONDS FOR ALL INDUSTRIAL PURPOSES

KOEBEL

Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13

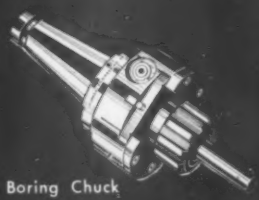
Clamp work in jigs fast and easy with UNIVERSAL GRIPPITS

You save time, trouble, and money when you lock work in jigs and fixtures with Universal Grippits. They clamp *quick, firm, and easy* — faster than two-action set screws, easier than cams. To install grippit in fixture, insert in tapped hole. To clamp work, turn grippit head one-eighth of a revolution. No hammering, no forcing, because Universal Grippits *clamp positively — even on work with odd contours.* Only the clamping screw rotates, not the plunger, so the work is not marred. Made of specially hardened steel, with contact points lubricated to eliminate friction. Made in three sizes for practically every type of jig and fixture clamping job. *Write for complete facts.*



UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND EFFICIENCY IN YOUR PLANT

Index Plunger

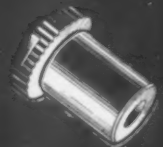


Boring Chuck

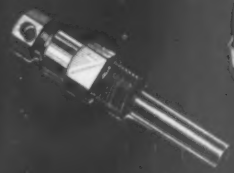
Standard Collet Chuck

Mikro-lok Boring Bar

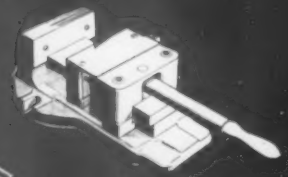
Floating Chuck



Standard Drill Bushing



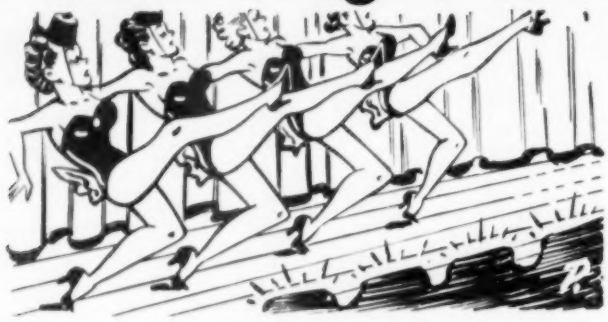
Grippit



Wedge-Lock Production Vise

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 2, MICHIGAN

Perfect Alignment!



with GLENCO Floating Tool Holders

Any stock size will be sent you for your inspection and test for 30 days, subject to return if unsatisfactory.

Utility Tools

Compensating movements under load achieve positive correction of misalignment on hand and automatic screw machines, Garvin tapping machines, adjustable multiple spindles, tapping machines of all types, and drilling machines, all types.

THE J. C. **GLENZER** CO., Inc.
6467 EPWORTH BLVD. DETROIT 10, MICH.

STEP UP **OUTPUT** *with a*

SHAPE-RITE SHAPER

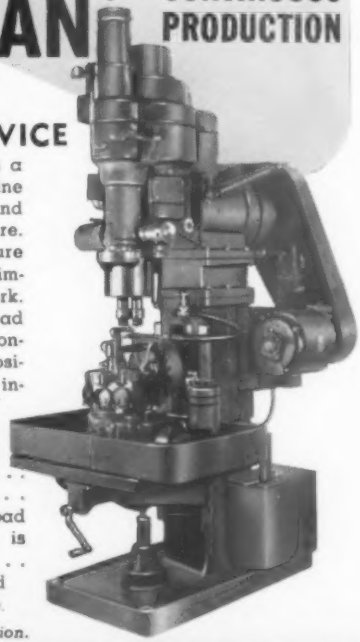
8" Stroke Heavy-Duty Model

With the popular SHAPE-RITE SHAPER, your tool, die and precision part output is greatly increased because of easy quick set-ups, extreme built-in accuracy, and speedy operation. Takes a full 8" cut. Provides short planing on production work.

See your local dealer or write Dept. E-58

Sales Service Machine Tool Co.
2363 University Avenue St. Paul 4, Minnesota

PRECISION BUILT
TAPPING MACHINES
KAUFMAN *for* CONTINUOUS PRODUCTION



HI-DUTY PRECISION SERVICE

The Kaufman No. 10A is a Hi-Duty Tapping Machine with two spindle head and eight station index fixture. Same machine with fixture changes can be used for similar second operation work. Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positive wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect overload and jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable.

Send for complete information.

KAUFMAN MFG. CO.
MANITOWOC, WISCONSIN

Get in on these PRODUCTION INCREASES!

● Get your company on the growing list of manufacturers who are getting from 3 to 10 times more production per carbide tool, by using Improved TECO Cemented Carbide. Production schedules move up—tool costs and machining costs go way down.

A FEW CASES*

Boring R. R. Journal Boxes

Pieces per grind (TECO)	14
Best previous carbide	2

•

Turning O. D. Steel Rotor

Pieces per grind (TECO)	350
Best previous carbide	120

•

Boring R. R. Car Wheel (Steel)

Pieces per grind (TECO)	200
Best previous carbide	60

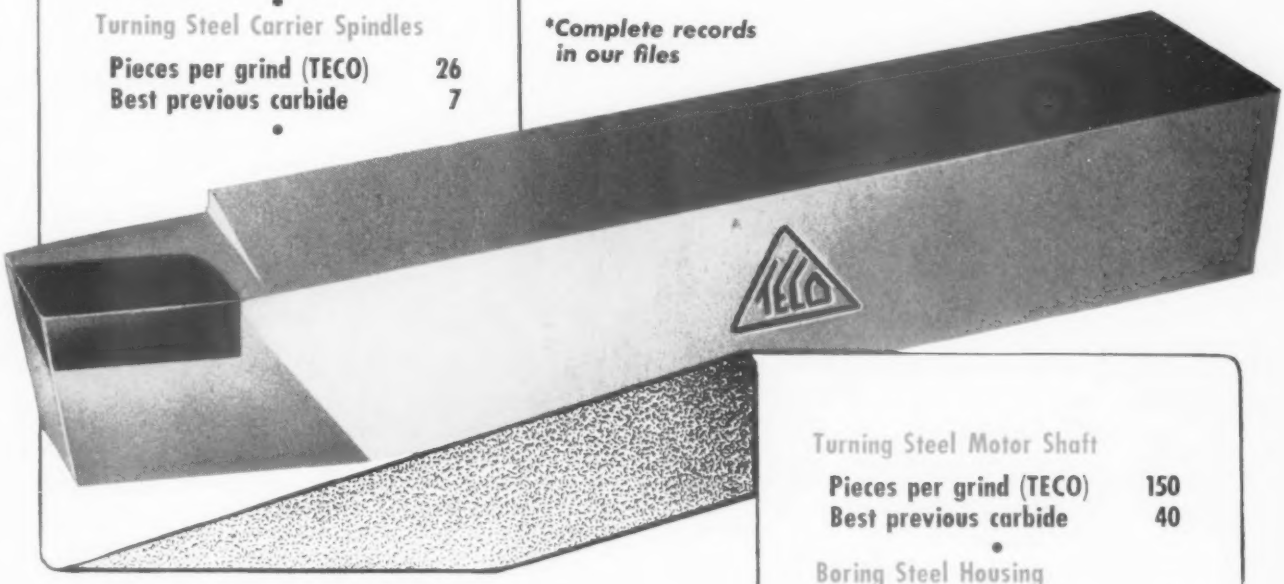
•

Turning Steel Carrier Spindles

Pieces per grind (TECO)	26
Best previous carbide	7

•

Complete records in our files



Turning Steel Motor Shaft

Pieces per grind (TECO)	150
Best previous carbide	40

•

Boring Steel Housing

Pieces per grind (TECO)	36
Best previous carbide	5

•

Turning Cast Iron Piston Rings

Pieces per grind (TECO)	12,000
Best previous carbide	2,500

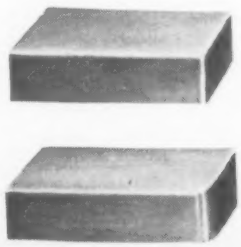
•

Many more on file

TRY A RUN! Tool up a machine with Improved TECO in place of present carbide tools. Check your pieces per grind—grinds per tool—down time—total tool life—tool cost. Send details of job when ordering tools or blanks, for proper recommendation. Ask for catalog and price list.

TUNGSTEN ELECTRIC CORP. 570 39th ST., UNION CITY, N. J.

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Detroit, Mich.



Manufacturers of
TECO CARBIDE BLANKS and TOOLS

All standard sizes and styles. When ordering any carbide tools specify "Teco —no substitute."

Improved
TECO
CEMENTED CARBIDE

Manufacturers of Tungsten Carbide—from ore to finished material—for over a quarter century.

At last!!

A BALL BEARING FOR YOUR LINEAR MOTIONS

BALL BUSHINGS

Sliding linear motions are nearly always troublesome. *Unlimited travel* BALL BUSHINGS can be used to tremendous advantage on guide rods, guide posts, reciprocating shafts and for support of any mechanism that is moved or shifted in a straight line.

LASTING PRECISION ALIGNMENT
ELIMINATE BINDING and CHATTER
ZERO SHAKE or PLAY
LOW FRICTION and WEAR
LONG LIFE — LOW MAINTENANCE
SOLVES SLIDING LUBRICATION PROBLEMS

Now available for ¼", ½", ¾" and 1" shaft diameters. Additional sizes to follow.

Write for literature and name of our representative in your city. No obligation, of course.

THOMSON INDUSTRIES, INC.
Dept. A, MANHASSET, N. Y.
PLANTS: Mineola, Long Island.... Lancaster, Pa.

FRICTION COSTS MONEY
ROLL IT — DON'T SLIDE IT

"MASTERCASING"... A WORD YOU WON'T FIND IN THE DICTIONARY, *BUT*...

It means a lot to men who have used MASTERFORM high speed cutting tools. This special heat treating process in MASTERFORM tools assures the ultimate in cutting tool efficiency — *maximum production at minimum tool cost.*

Actual production data reports show that MASTERFORM cutting tools have up to **500% LONGER LIFE**

Want faster, deeper cuts . . . precision hole production? Write for complete information and prices on our standard tool designs, or submit your special tool design problems to our engineering department.

WE SPECIALIZE IN CARBIDE TIPPED TOOLS

MASTERFORM TOOL CO.
2532 Irving Park Road · Chicago 18, Ill.

IMPROVED EFFICIENCY

Photo courtesy American Broach & Machine Co.

WITH

RUTHMAN GUSHER COOLANT PUMPS

For improved efficiency in your metal cutting operations specify Ruthman Gusher Coolant Pumps.

Oversized pre-lubricated bearings reduce maintenance cost. Electronically balanced rotating parts assure quiet operation and longer life. Split-second control of coolants, from a trickle to full volume, gives coolant flow where you want it when you want it.

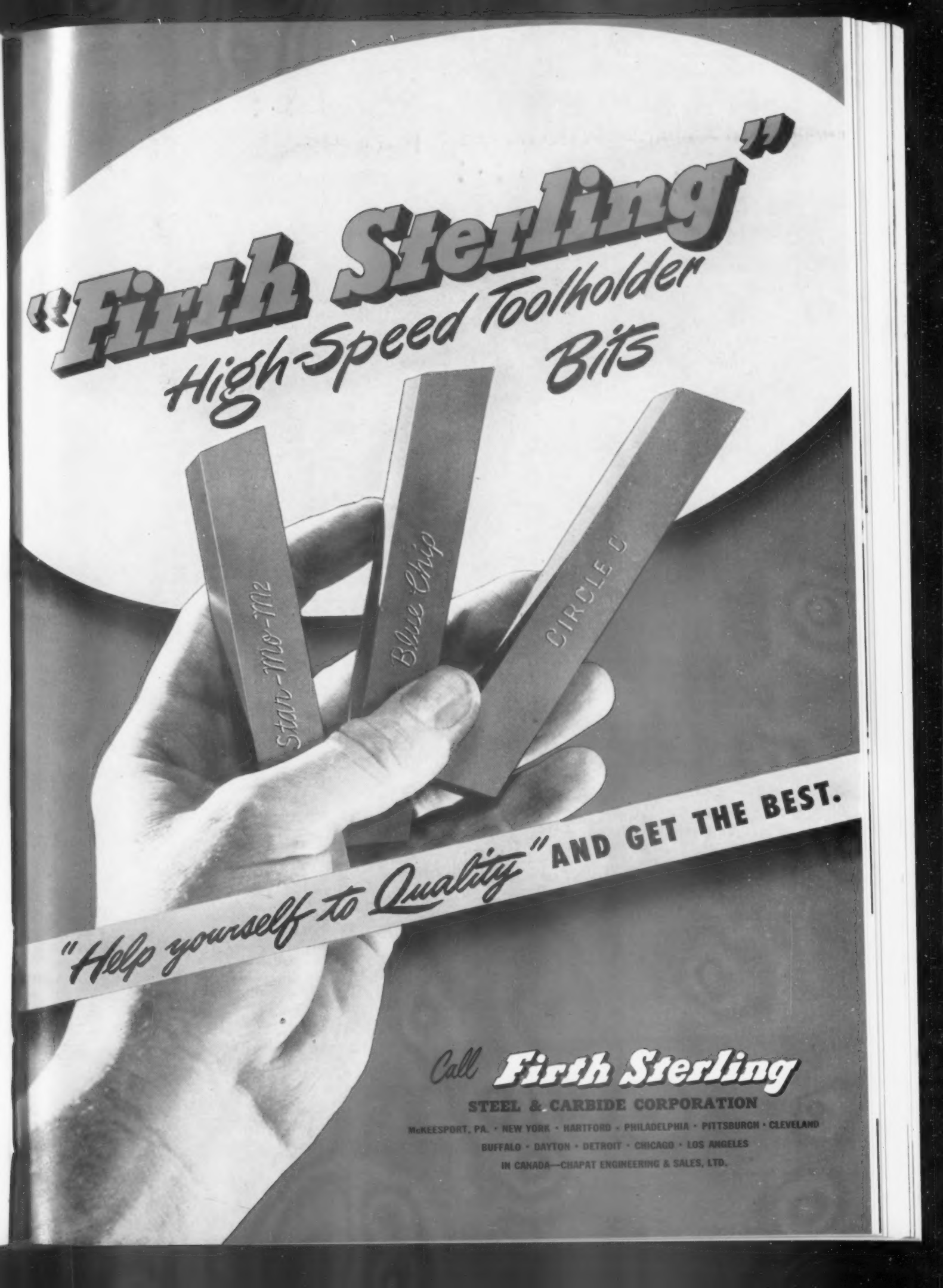
Illustrated is an American VP-5-25-40 Broaching Machine equipped with a Model 11022-C ½ HP Gusher Coolant Pump.

Write now for Catalog 10-1

THE RUTHMAN MACHINERY CO.
1810 Reading Road — Cincinnati 2, Ohio

"Firth Sterling"

High-Speed Toolholder Bits



"Help yourself to Quality" AND GET THE BEST.

Call **Firth Sterling**

STEEL & CARBIDE CORPORATION

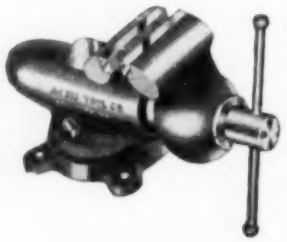
McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA · PITTSBURGH · CLEVELAND

BUFFALO · DAYTON · DETROIT · CHICAGO · LOS ANGELES

IN CANADA—CHAPAT ENGINEERING & SALES, LTD.

ACME BENCH VISES
Give Reliable Performance

Constructed to give Maximum Efficiency and Longer Life



Moving Parts of High Tensile Semi-Steel Casting. Minimum Wear of Moving Parts.

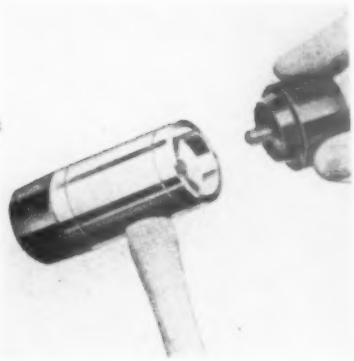
Chips and Dust Cannot Enter Totally Enclosed Body. Interchangeable and Removable Ground Jaws.

Made in Sizes from 2 to 6 inches.

NUPLA MALLETS
with Interchangeable Tips

• • • •

Nupla Mallet Tips give you tough, resilient and self - healing qualities that no other mallet possesses. Made in three grades. "S"-Soft, "M"-Medium, "T"-Tough.



Will not mar machined or delicate surfaces. No "Flying Particles" to endanger workmen's eyes. No sting, vibration or rebound.

No explosion or fire hazard.

Can be had non-conductor of electricity (specify when ordering).

"A Mallet for Every Purpose; A Purpose for Every Mallet"

PRECISION PRODUCTION TOOLS

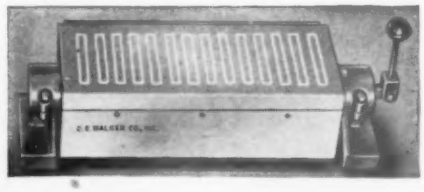
ACME TOOL COMPANY

75 West Broadway New York 7, N. Y.

Save Time—Save Costs—Promote Accuracy.

Walker PERMANENT MAGNETIC CHUCKS give you more holding power . . . more magnetic area. . . . No wiring—these chucks are energized by the Walker method that retains holding power *indefinitely*. Whatever your holding problem Walker has the *modern* answer. Hold everything with Walker Chucks. Sizes — 4″ x 8″, 5″ x 10″, 6″ x 12″, 6″ x 18″, 8″ x 24″. Also 9″—12″ Rotary and same sizes in Swivel design.

Hold Everything! with Walker Chucks



Walker Chucks

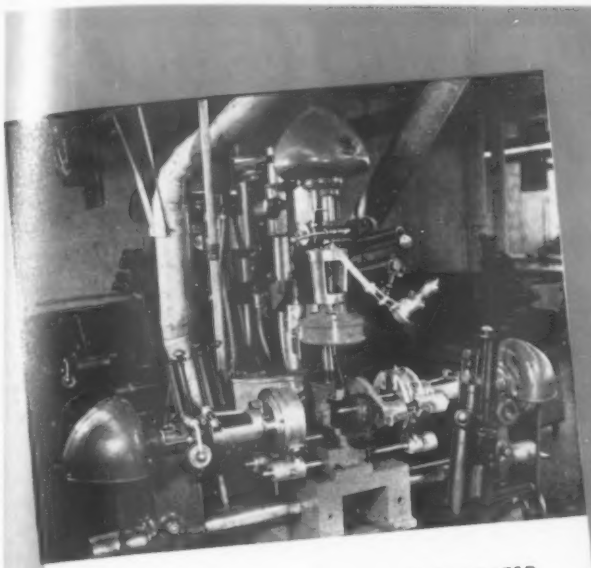
O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

Walker Chucks

How the Makers of BEACON CAMERAS Use "Controlled-Air-Power" to cut production costs . . .



WHITEHOUSE PRODUCTS, INCORPORATED
360 FURMAN STREET
BROOKLYN 2, N. Y.

December 9, 1947

The Bellows Company
222 W. Market Street
Akron, Ohio

Gentlemen:

Part of our ability to produce our new top quality Beacon Camera at a low cost figure is certainly due to some of the multiple drilling operations we are handling on special machines equipped with Bellows "Controlled-Air-Power" DFE Feeds.

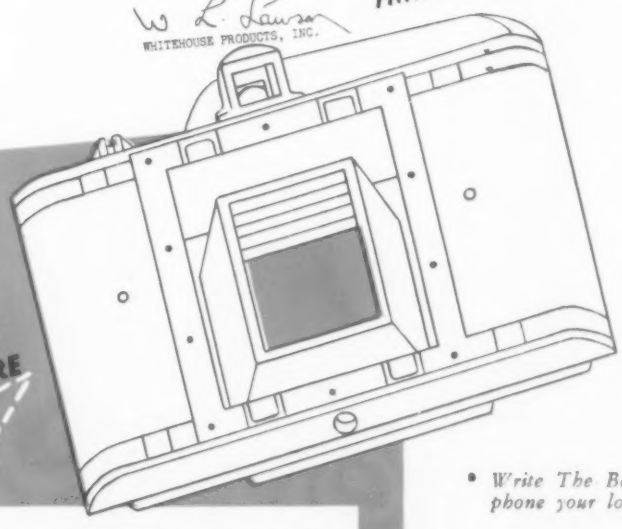
For example, on one set-up we are drilling ten #55 holes on one plane, three #51 holes on a second plane, two #38 holes on a third plane, and drilling and countersinking one ¼" hole on a fourth. The material, as you know is bakelite.

In addition we are using two other drilling set-ups with Bellows Feeds for certain other operations, and are now in the process of installing a fourth multiple drill unit, likewise equipped with your "Controlled-Air-Power" Feeds.

Yours very truly

W. L. Lawson
WHITEHOUSE PRODUCTS, INC.

EVERY HOUR 5760 HOLES ARE DRILLED AND 360 COUNTERSUNK IN 360 ACCURATELY FINISHED PARTS



Using standard units, you can build in your own tool room, or have built by established engineering firms, inexpensive "special purpose" machines for low cost machining of precision parts.

In fact, manufacturers everywhere are proving that such units pay for themselves quickly, often with the first few days production increase.

The simplicity, ready adaptability and low cost of Bellows "Controlled-Air-Power" Devices (non-rotating Air Motors, air-powered work or tool feeds, air-powered vises and holding fixtures) make such special purpose machines both economical and practical, whether the run is long or short.

WE'D LIKE TO TELL YOU MORE ABOUT IT

• *Write The Bellows Co., Bellows Bldg., Akron, Ohio, or phone your local Bellows Field Engineer.*

The installation shown in this ad is described in detail in Foto Facts File FF47-359. We will be happy to send you this and other Foto Facts File Sheets, together with the new 16 page bulletin "Controlled-Air-Power." No cost or obligation, of course.

The Bellows Co.
AKRON, OHIO

TAPPING TIPS

From Woody Spencer's Notebook

Sometimes Preaching Means Too Many "Don'ts"!

Listened to a preacher the other day an' he sure was heavy on the "don'ts". Made me wonder if my "preachin'" has too many "don'ts" and not enough "dos" an' "how to's". Fer instance, keepin' a tap sharp is only half the job; keepin' it sharpened *right* is the rest. Here's a few "do's" fer keepin' taps sharpened right: (1) Fer best results, use a tap grindin' machine if possible. (2) If necessary to sharpen taps by hand, use the proper grain and grade wheel. (3) When sharpenin' taps on a grinder, take light cuts, otherwise the threads may be burned.

These Tapping Tips of Woody's aren't technical advice nor are they any cure-all for tapping troubles. They are just hints, ideas and short cuts some of the boys have given Woody and he's passing them on in the hope that they may serve to make some routine tapping job run a little smoother and faster, maybe save a few rejects.

When technical questions are involved, bring them to the engineers. Send complete data on the job—material, depth, diameter of hole, type of hole, lubricant, whether the hole is through or blind. Our engineers will be glad to give you definite suggestions covering your problem.

Note—Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them.

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

DRILL JIG BUSHINGS

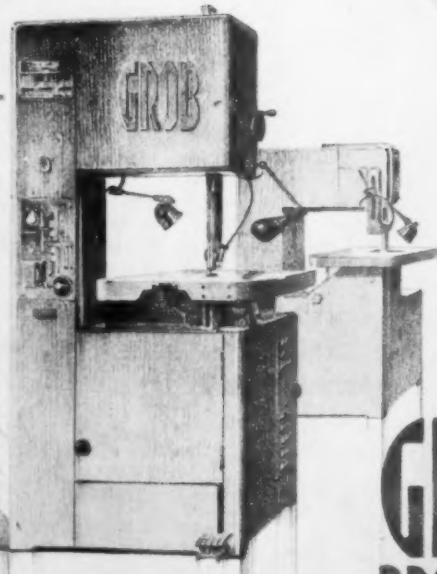
Accurate
Interchangeable
Concentric

Acme
Industrial
Company

WRITE FOR FREE CATALOG

200 N. LAFLIN STREET, CHICAGO 7, ILLINOIS

SAWING FILING



GROB BROTHERS

GRAFTON WISCONSIN

The wedge is the world's simplest and strongest mechanical device.

the wedge begets

the only cutter with immovable blades

All O K MILLING CUTTERS and MULTIPLE OPERATION TOOLS consist of just TWO components — the BODY and the BLADES. This revolutionary idea was the conception of a practical toolmaker, a man endowed with the genius of simplicity. A block of steel forged into the shape of a wedge became the blade, with one side smooth, the other serrated. Blade slots in the body were tapered and serrated to match. This prevented tipping and permitted close adjustment to compensate for wear. The locking principle makes blades immovable during a cut and replaceable with minimum downtime. No pins, screws, gibs or extraneous locking devices are needed.

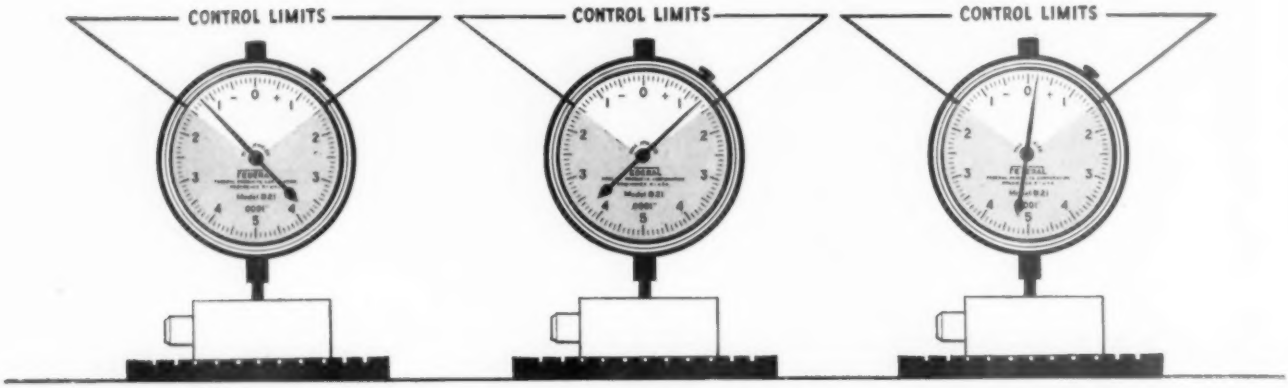
Write for new catalog 13.

the OK Tool Company, inc.

30 HULL ST., SHELTON, CONN.

Warning!

It's time for new eyes in your production line – to make the work come through right the first time – to let your workers see what they're making – to adjust machines before they produce scrap.



I'm about to produce under-size pieces!

I'm about to produce over-size pieces!

I'm well within my control limits!

Dial Indicator Gages tell the mechanic what he wants to know. They show him whether the part is too large or too small; they also show him *exactly how much the workpiece is off standard.* He gets an accurate reading *at a glance;* he saves time; he no longer relies on the sense of "feel".

Furthermore, and most important, the Dial Indicator tells the operator exactly how much the work is tending toward the high or low limit. Hence, he knows how much or how far to readjust the setting of the machine.

When control limits are set up on a Dial Indicator, the machine's tendency to exceed these limits is quickly spotted; the machine is adjusted *before the scrap is produced.*

This method of Quality Control is adaptable to both large and small-scale production —and to many non-mechanical products, as well as to mechanical. A Dial Indicator can be applied to gage any linear dimension.

We make Dial Indicators and Dial Indicator Gages — both regular and custom-built — to meet the needs of users in hundreds of industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages. Our collective experience is available to you—through the Federal field representative in your territory or direct from our design department and factory. You may save both time and money by calling upon this experience.

FEDERAL

FEDERAL PRODUCTS COPORATION

YOUR PROFIT DECISION IS *Visible** PRECISION

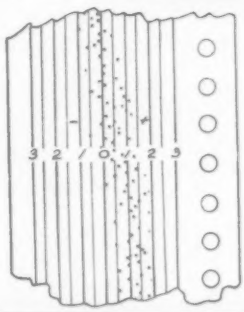
*The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both standard and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions.

QUALITY CONTROL

reduces scrap, saves machine and man hours

Instead of inspecting workpieces *after* they are completely made . . . Statistical Quality Control—with the help of Dial Indicator Gages—samples the dimensions of workpieces as they are being made right at the machine. The findings show immediately whether the work is satisfactory—give advance warning when a machine is tending to exceed its control limits. This stitch-in-time method reduces scrap, prevents losses in machine and man hours.

The continued use of Quality Control Methods leads to sensible standardizations in product, specifications, machine methods and materials. . . . Let us give you case histories.



This record warns of a trend toward over-size

RECORD AS YOU GAGE

with this new Recording Gage

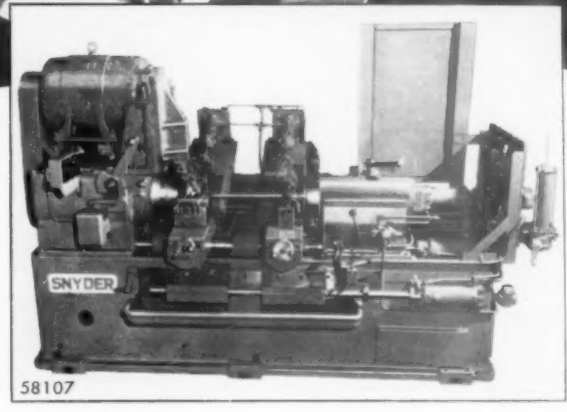
Here is a precision instrument which measures small parts—up to 1.000"—and simultaneously records in ink, on a paper chart, the deviations of the measured parts from the specified dimension. A deviation of .001" produces a change of .150" in the position of the dot on the record. This Recording Gage is easily used by an unskilled inspector. With no calculations, the operator is warned to adjust the machine before it produces parts outside of control limits. In addition, a permanent record of the dimensional quality of the workpieces is provided.

Write for illustrated Bulletin # 29 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION **1144 Eddy St., Providence 1, R. I.**

Represented in Canada by RUDEL MACHINERY COMPANY, LTD.

Look ahead with Snyder!



58107

AXLES will cost less because of this SNYDER LATHE

Nine and a half tons of rigidity, speed and accuracy, this special lathe, designed and built by Snyder, uses newest developments in clamped-on, round, triangle and other shaped carbide tools to turn out 75 to 80 pieces an hour at 80% efficiency.

As shown, the machine is tooled for turning and facing rear axle shafts and in one operation finishes all diameters and faces to size (except for grinding stock on the bearing and oil seal diameters). It also can be applied to a wide range of other parts with minimum change-over. Center drive unit and other attachments can be added any time.

All feeds are hydraulic, quickly adjustable by dials for each attachment. Spindle speeds are controlled by readily accessible pick-off gears. All moving parts are automatically lubricated. Work cycle is automatic.

Money saved through HIGHER production efficiency is clear profit. Maybe Snyder can help you. Write *Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.*

SNYDER SPECIAL MACHINES CONTROL COSTS

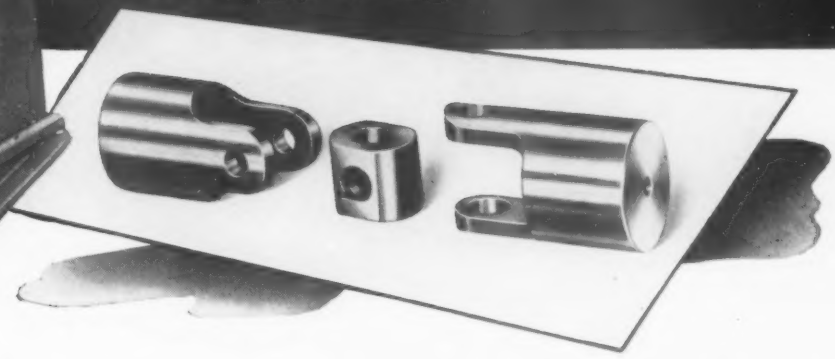
23 Years of Successful Cooperation with Leading American Industries

SNYDER TOOL & ENGINEERING CO., DETROIT 7, MICH.

SUNNEN

Production Honing

on Curtis Universal Joints Assures Smooth Operation, Maximum Life, Trouble-free Service



Typical Jobs

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Inner Bearing Ring. "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Shell Loading Die.

Like hundreds of other manufacturers, Curtis Universal Joint Co., Inc., uses the Sunnen Precision Honing Machine to provide smooth accurate surfaces that increase the life of production parts. This machine enables Curtis to "precision fit" tandem, as well as single holes as shown in the illustrations above. Close tolerances and full bearing surfaces produced by Sunnen honing means that Curtis Universal Joints have an unusually free, easy action.

The Sunnen Precision Honing Machine hones every internal diameter from .120″ to 2.625″ in steel, cast iron, aluminum, bronze, carbide, plastic, ceramic or glass.

Accuracy is guaranteed within .0001″ — and a complete range of stones is available to produce any micro-inch finish desired. In hardened steel a finish of 2 to 3 micro-inches can be obtained.

The Sunnen Precision Honing Machine operates without jigs or fixtures — can be set up to operate in less than one minute — corrects errors of out-of-round and taper — does not require skilled labor — is easy to operate and low in cost.

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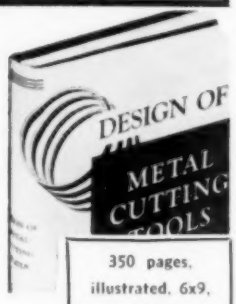

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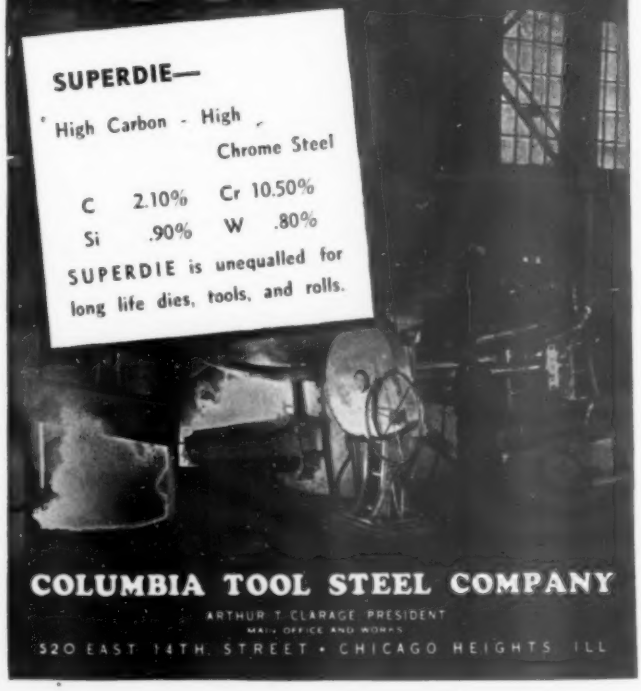

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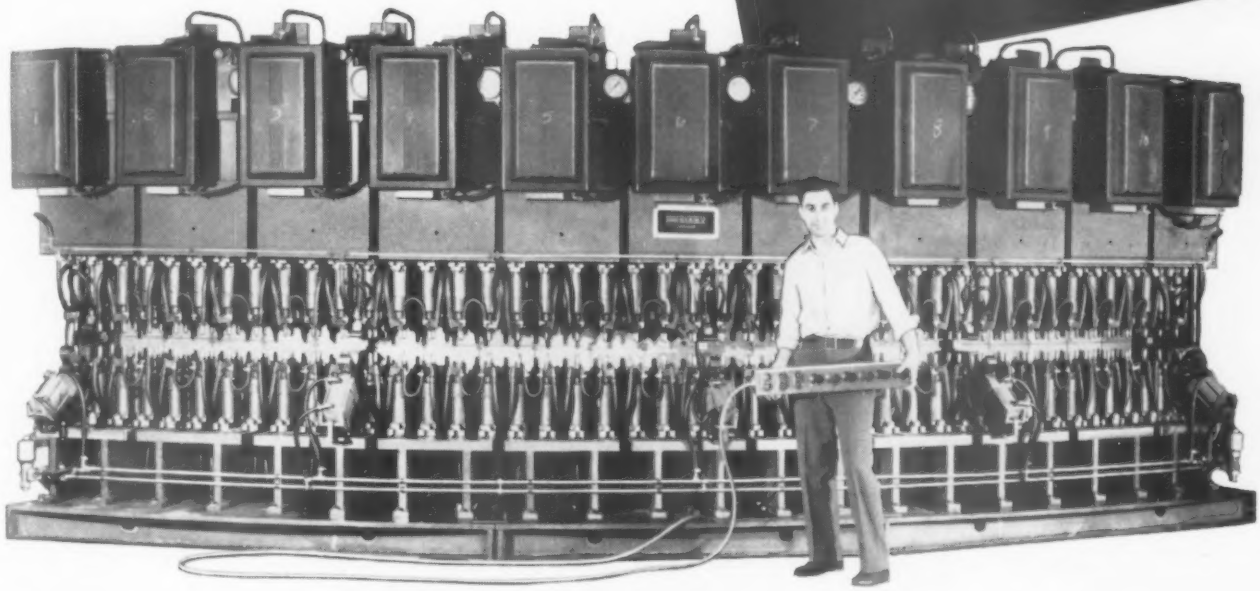

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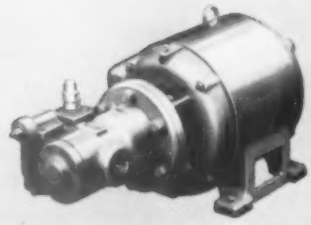

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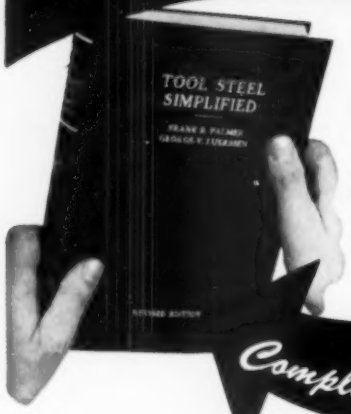

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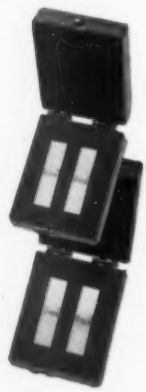

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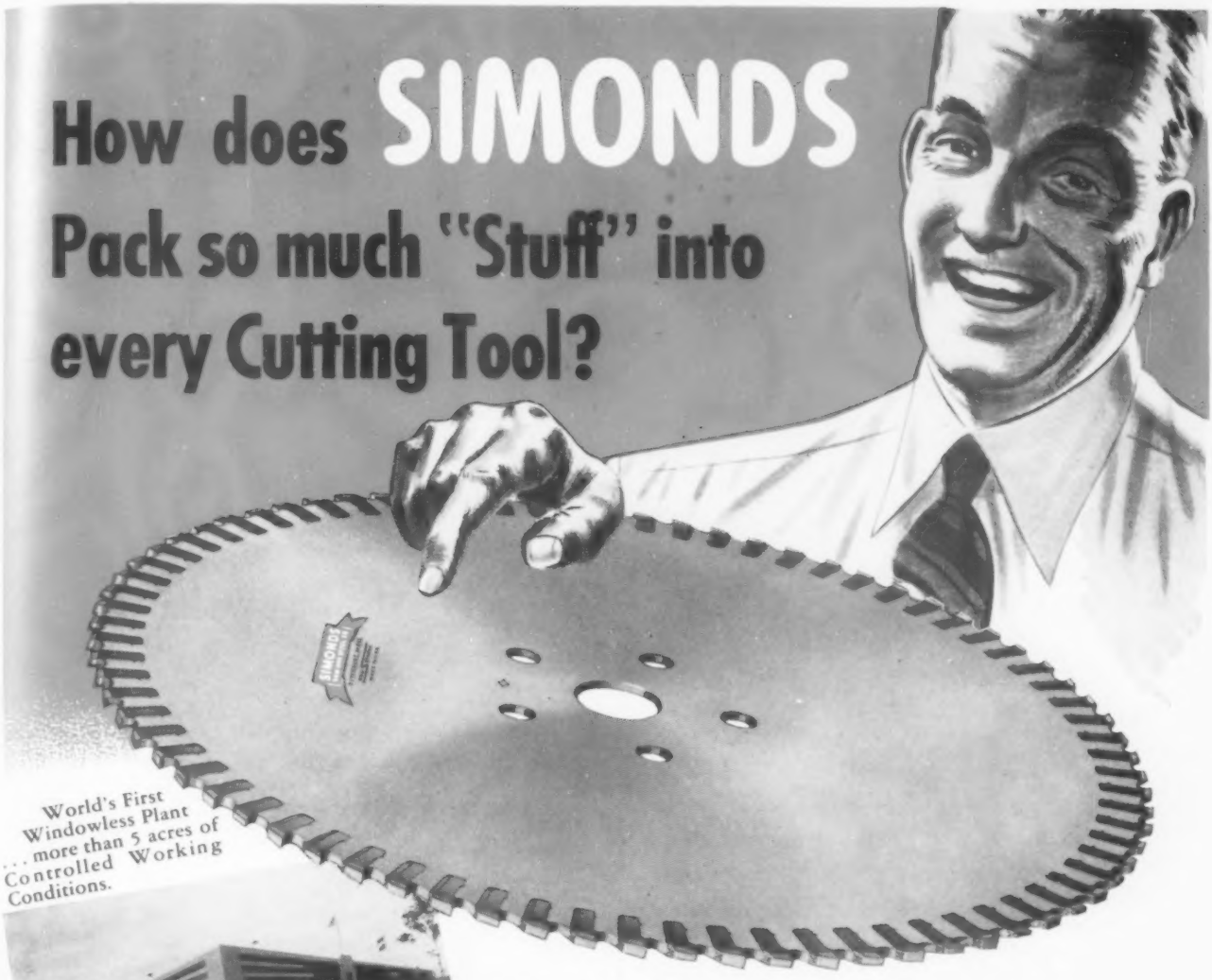

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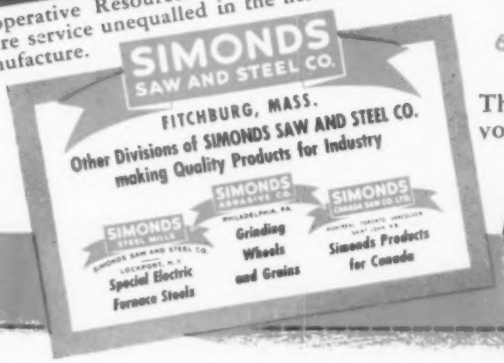
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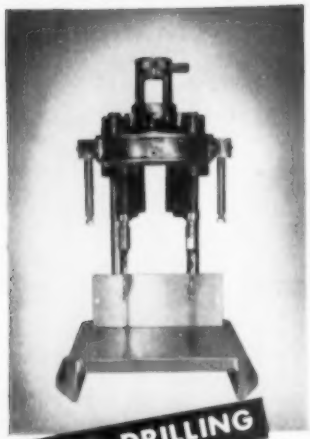

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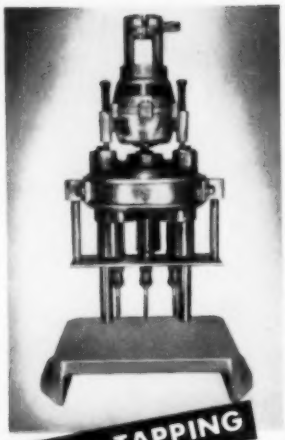

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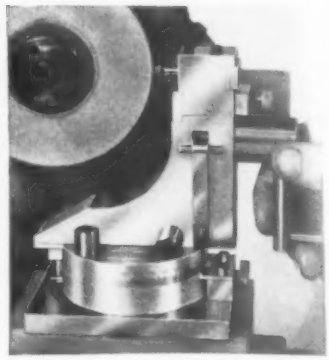

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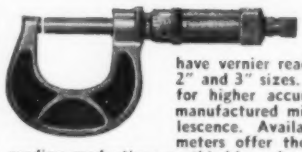

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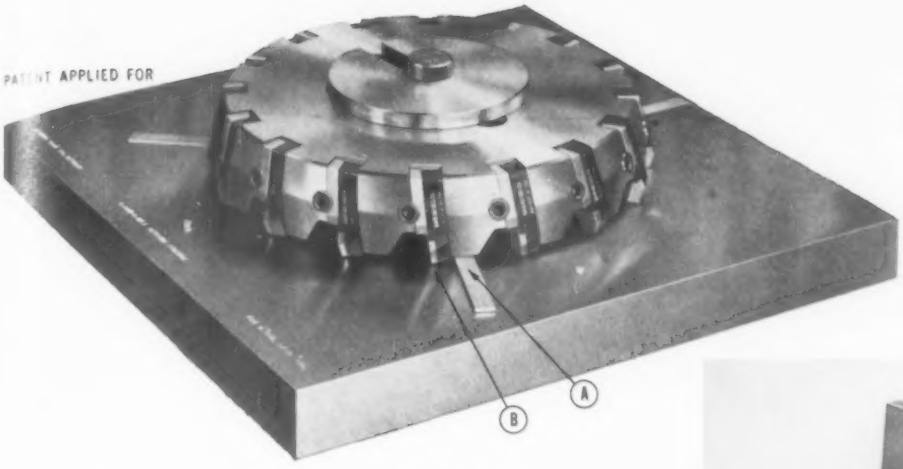

1. Assembly fixture for rapid, uniform blade setting. Machined surfaces of lugs rest on parallels "A". Blades are inserted and pushed down till they touch top of plate "B", thus insuring uniform projection of 1/8 inch beyond cutter body.

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The New Gairing Carbide Face Mill through new process of reconditioning reduces down time of machines

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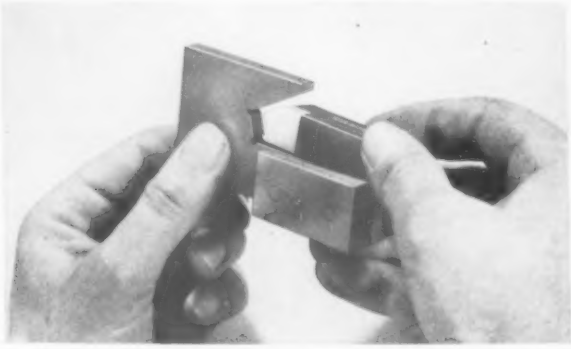

2. Blade checked by gage after grinding.

In the grinding room alone, the E-Con-O-Mill saves its cost quickly. It cuts expense three ways:

1. *New blades* need no grinding. They are furnished finish-ground. They come individually cartoned to be kept in stock, ready to be assembled in cutters.

2. *Assembly of blades* is done by hand. Each is held firmly by tightening one lock screw and wedge, both being integral with body at all times. To insure uniform blade projection, we furnish the fixture illustrated (*Fig. 1*), which accommodates all cutter sizes. Thus accurate blade setting is assured within .0015 inch uniformity. Should greater accuracy be required, then diamond wheel grinding to remove a maximum of .0015 inch from just the ends of the higher blades is required.

3. *Re-sharpening of blades* is done on a carbide grinder. A checking gage, furnished by us (*Fig. 2*) insures rapid and accurate duplication of cutting edges, making re-sharpened blades ready for assembly in cutter bodies. Or the blades may be put in stock, to be drawn out whenever required for assembly in bodies.

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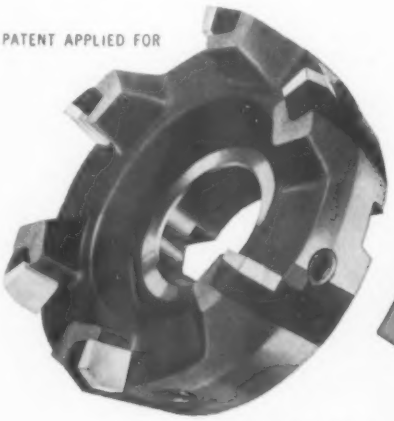

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CUT DOWN YOUR TOOL INVENTORY

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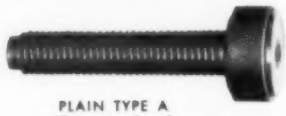
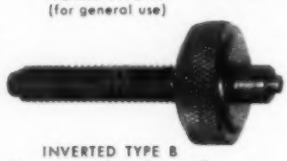
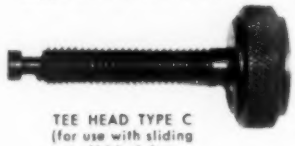


PLAIN TYPE A
(for general use)



INVERTED TYPE B
(supports work on short end)



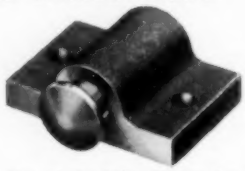
TEE HEAD TYPE C
(for use with sliding V-blocks)

The above shows simplicity of Torque Thumb Screw mechanism — nothing to get out of order — life-long uniform action.

17 sizes, individually boxed, offers various types and end pressures required.

SPRING PLUNGERS AND SPRING STOPS

Standard threads for mounting in fixture walls. Simply tap mounting hole, screw spring plunger in position and lock with nut or set screw. Rounded plunger nose permits easy insertion of workpiece and spring pressure maintains tight, firm contact. Hardened plunger ends, telescope within body. Rust-proofed. Individually boxed.



Use of the Vlier Spring Stop where no wall sections are available. Flanges are jig drilled for bolting to fixture bases. Plunger end hardened. 14 lbs. end pressure. Rust-proofed, packed 6 to a box.

MULTI-DIMENSIONAL FIXTURE KEY

Counterbored hex nut having stepped sides. Milled from oversize stock in order to maintain close tolerance of ± .0005 between stepped sides — assuring perfect alignment. Each pair of stepped sides form three individual key widths which fits a standard table slot. Two Keys in any fixture can be readily used on three different machines having varying slot dimensions.

Write today for detailed descriptive literature and location of nearest Vlier supply house.

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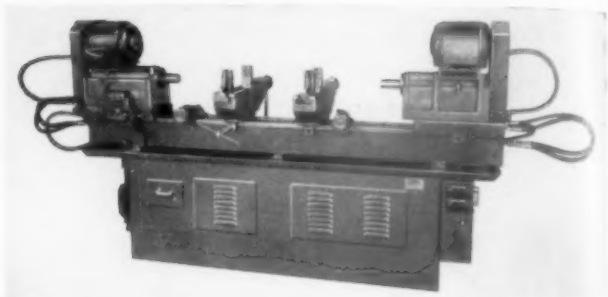

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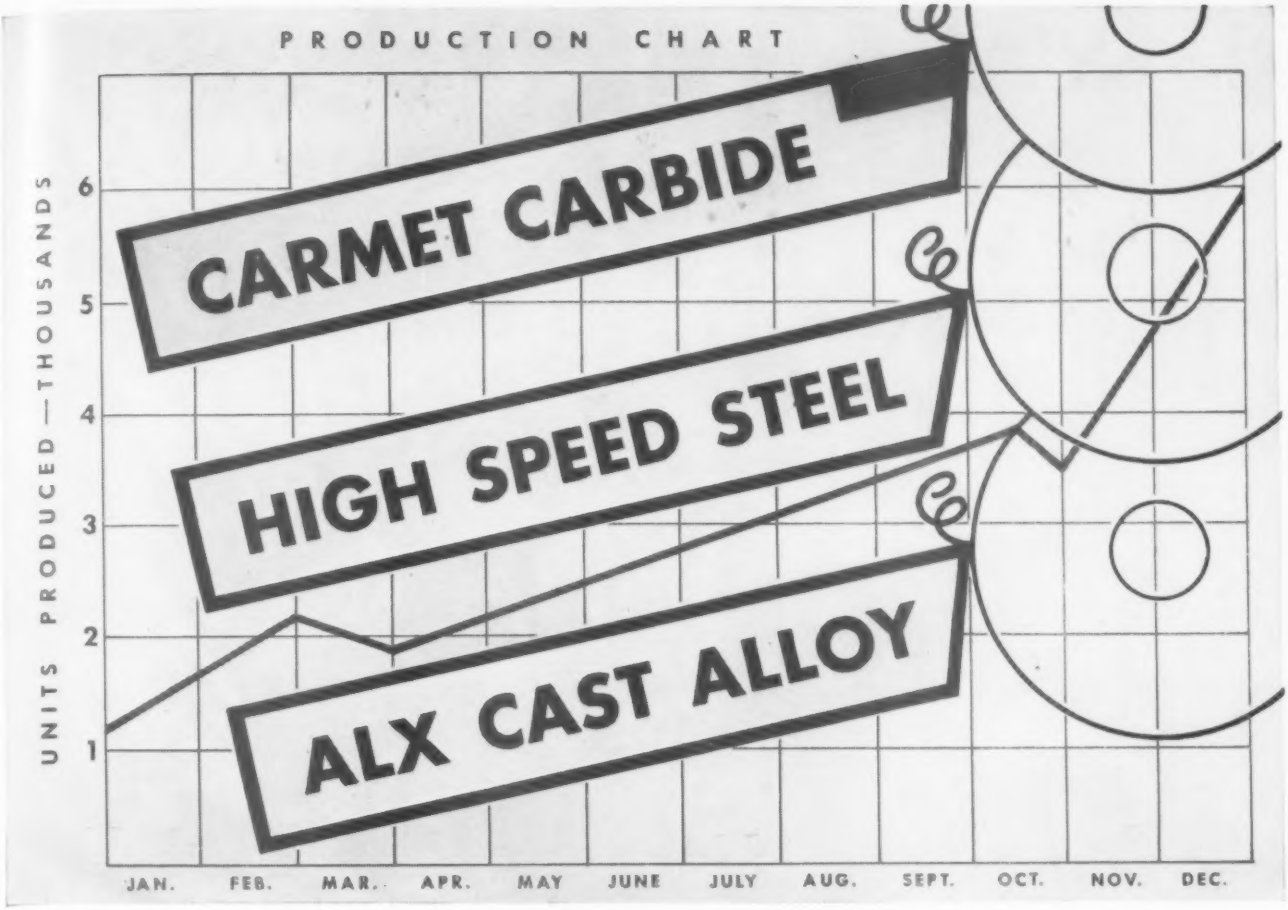

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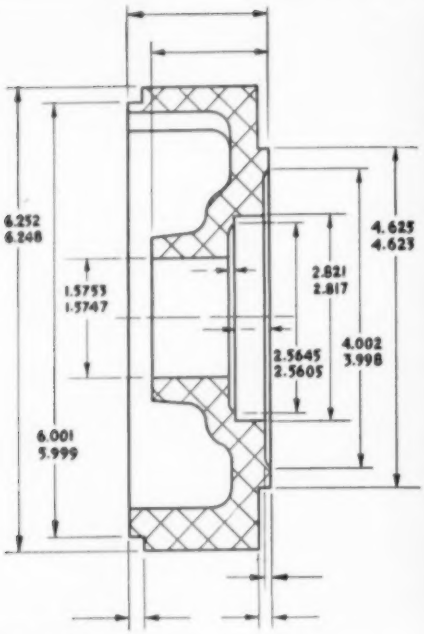
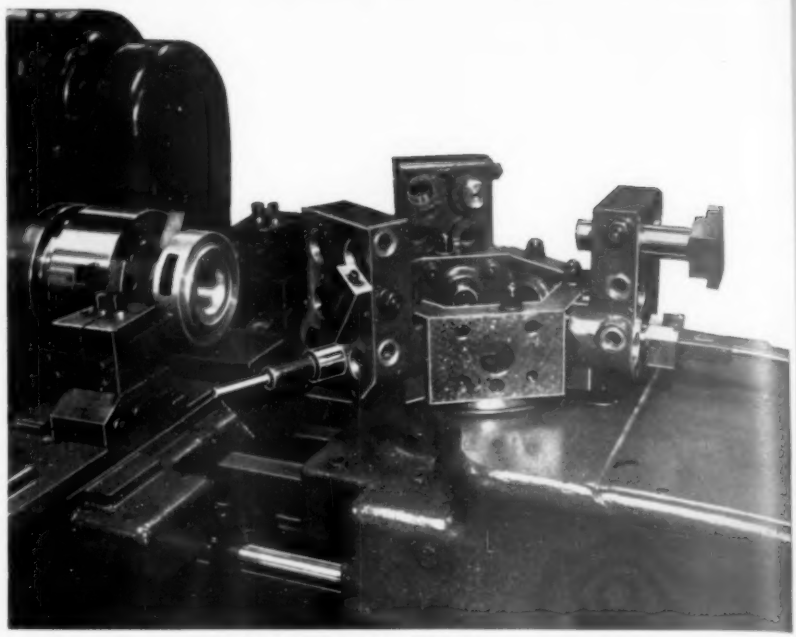
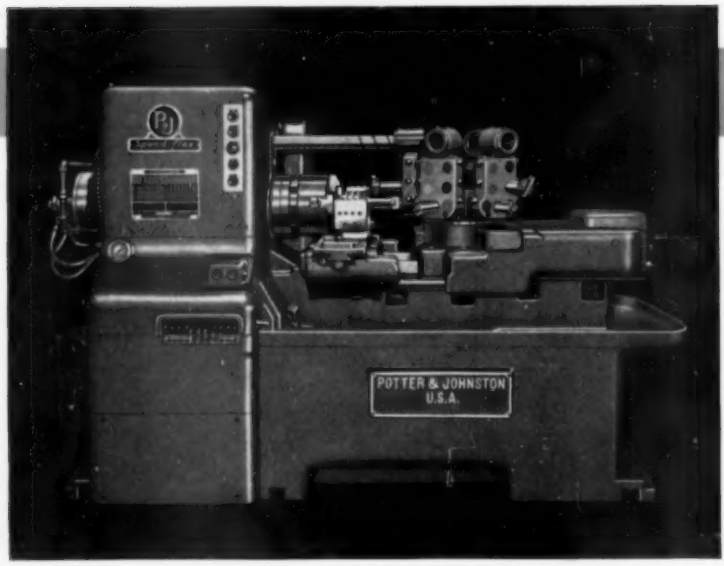


THE PART... Aluminum mounting end plate demanding *fast* metal removal



THE METHOD... Combination setups of simple turning tools and boring bars



THE MACHINE... P & J's 3-U SPEED-FLEX

the new Automatic Turret Lathe which gives "special tool" efficiency with versatile, low cost standard tools on many jobs like this.

High spindle speeds plus P & J ingenuity in combining operations plus instant chucking with stop pin locating are just some of the reasons why 37.5 of these parts are roughed out in a 51 minute hour—every hour—by the 3-U Speed-Flex.

This piece is rough bored, counterbored, rough turned; shoulder is faced, both sides of rim are faced, outside shoulder is form turned; all these surfaces then are "rough" finished and finally inner shoulder is size-turned. Only three turret faces are used.

If you have work up to 6 inches in diameter—nonferrous or ferrous castings, forgings or pressings—write to P & J for details on the 3-U way of cutting your costs by getting out more work to closer limits in less floor space. Operators prefer the 3-U Speed-Flex.

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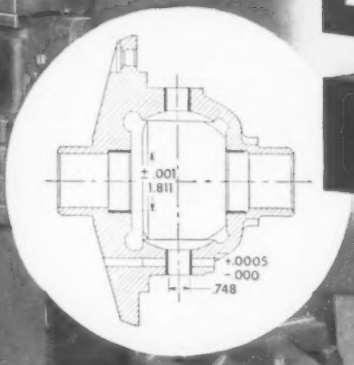

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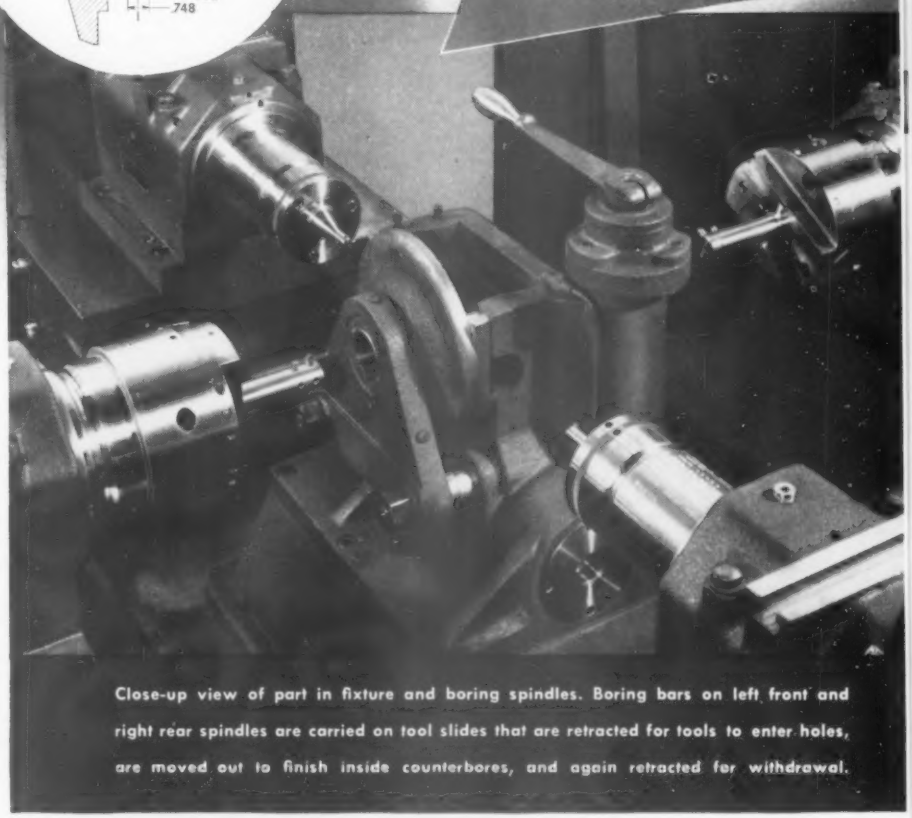

Close-up view of part in fixture and boring spindles. Boring bars on left front and right rear spindles are carried on tool slides that are retracted for tools to enter holes, are moved out to finish inside counterbores, and again retracted for withdrawal.

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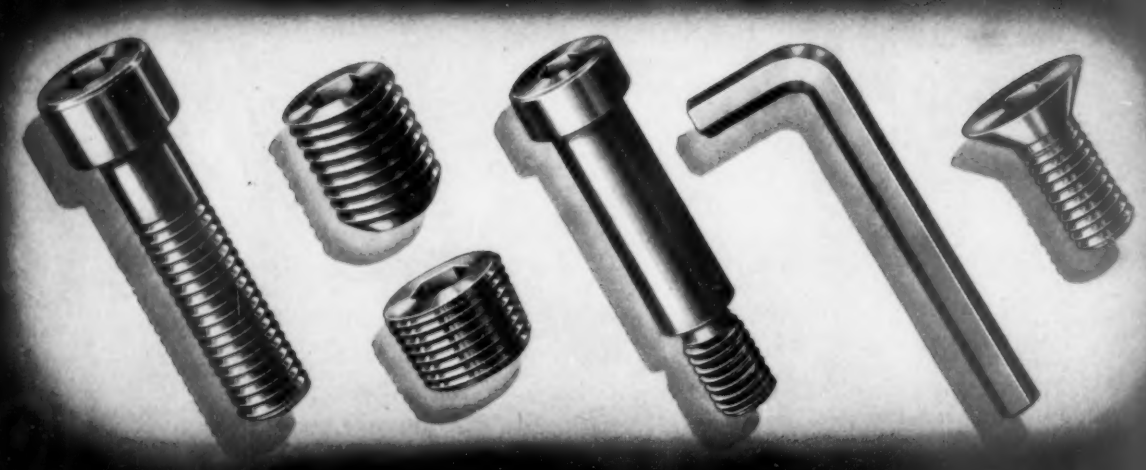

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